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SOME DIPLOCENTRID SCORPIONS FROM
BAJA CALIFORNIA DEL SUR, MEXICO

By

Herbert L. Stahnke

Poisonous Animals Research Laboratory
Arizona State University
Tempe, Arizona

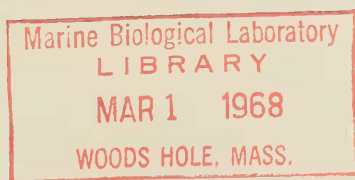
ABSTRACT: A new species, *Didymocentrus caboensis*, a new genus, *Bioculus*, and the following fourteen additional new species are described and keyed: *B. aguijensis*, *B. belvederi*, *B. cerralvensis*, *B. comondae*, *B. cruzensis*, *B. danzantiensis*, *B. figghoblyni*, *B. lindsayi*, *B. luteus*, *B. parraensis*, *B. parrishi*, *B. prolatio*, *B. santoensis*, and *B. similis*.

Diplocentrid scorpions have not been reported previously from Baja California, Mexico. Ewing (1928) does not include this taxon although he reports others from Baja California as well as several species of *Diplocentrus* from other parts of Mexico. Hoffmann (1931, 1932), likewise, gives no indication of this taxon in Baja. Although Gertsch (1958) reports fourteen Baja California scorpion species from the families Buthidae and Vejovidae, no mention is made of diplocentrids.

Most of the specimens used in this study were obtained from the California Academy of Sciences and the Chris Parrish collection. All of them are either of the genus *Didymocentrus* Kraepelin 1905 or the closely related new genus *Bioculus*. Hoffmann (1931) reports only the genus *Diplocentrus* from the Mexican mainland. The center of distribution of *Didymocentrus* seems to be in the West Indies.

Species determination was made difficult because of the small number of individuals at hand and their morphological homogeneity. When more specimens become available some of the designations may be synonymized. Details have been carefully reported so that future studies may be facilitated.

The differences in pattern of trichobothria, the sensory macrochaetes, have



been carefully indicated. The number and position of tarsomere II spines have been given as a fractional formula, e.g., $\frac{3}{3} \frac{3}{3}, \frac{4}{4} \frac{4}{4}, \frac{5}{5} \frac{5}{5}, \frac{5}{5} \frac{5}{5}$. The first duo of fractions refer to the left and right legs of the first pair, the second to the second pair of legs, etc. The numerator gives the spines on the inner margin while the denominator refers to those on the outer margin. Ratios, based on precise measurements, are also given.

Genus *Didymocentrus* Kraepelin 1905

- Diplocentrus* (in part) KARSCH, 1880, F., Ztsch. f. Gesam. Naturw., vol. 53, pp. 407-9. KRAEPELIN, 1893, Mitt. aus Naturhist. Mus. Hamburg, vol. 11, pp. 12-13; KRAEPELIN, 1898, Das Tierreich, vol. 8, pp. 99-100. Pocock, R. I., 1898, Ann. & Mag. Nat. Hist., series 7, vol. 1, p. 390. Pocock, R. I., 1902, Biol. Cent. Amer., pp. 2, 3. MORENO, A., 1938, Contribution al estudio de los escorpionides Cubanos Parte I. Superfamilia Scorpionidea. Mem. Soc. Cubana Hist. Nat., vol. 12, no. 3, pp. 191-201.
- Diplocentrus* Pocock, 1894, Jour. Linn. Soc., vol. 24, no. 155, p. 393. PENTHER, 1913, Ann. K. K. Naturhist. Hofmus., Wien, vol. 27, p. 2431. DEMELLO CAMPOS, OSWALDO, 1924, Os escorpiões Brasileiros, Mém. Inst. Oswaldo Cruz, vol. 17, pp. 239-363. WERNER, FRANZ, 1934, Scorpions, Pedipalpi, in Bronn, Klassen und Ordnungen des Tierreichs, vol. 5, p. 275, (has the two genera reversed). FRANGANILLO, B.S.J., P., 1934, Estudio de los Arachnides Recognidos durante el Verano de 1934, Rev. Belen, vol. 8, pp. 20-21. ROEWER, C. F., 1943, Über eine neuerworbene Sammlung von Skorpionen des Natur-Museum Senckenberg, Senckenbergianna, vol. 26, no. 4, p. 224. MELLO LEITAO, C. de, 1945, Escorpioes Sul-Americanos, Arquivos do Museo Nacional, vol. 40, pp. 32-36.
- Didymocentrus* KRAEPELIN, K., 1905, Zool. Jahrb. Abt. f. Syst., vol. 22, no. 3, p. 342.

Kraepelin (1905) established this genus on the basis of one characteristic, i.e. absence of lateral lobes (terminal lobes) on tarsomere II. Sides of this tarsomere acute angled, instead of rounded as in *Diplocentrus*, and ventral row of spines form approximately straight line. Leg IV generally with five or six fairly well separated spines. Most scorpions of this genus relatively small, seldom larger than 48 mm.¹; have *three* pair of lateral eyes; exterior pedal spur; pectinal teeth range in number, in most cases, from five to ten and first tarsomeres generally as wide or less wide than tibia.

Didymocentrus caboensis Stahnke, new species.

DIAGNOSIS. Related species, *Didymocentrus antillanus* Pocock; type localities: Islands of St. Lucia and St. Vincent of Antilles. New species differs from this one in the following respects:

| <i>D. caboensis</i> | <i>D. antillanus</i> |
|---|--|
| 1. Only pedipalps punctate | Entire body punctate |
| 2. Four to five middle lamellae | One or two middle lamellae |
| 3. ♀ pectinal teeth 10 | ♀ pectinal teeth 8 or 9 |
| 4. M ₁ trichobothrium definitely on manus | M ₁ on base of fixed finger |

¹ *D. taibeti* Caporiacco, 1938 of Guatemala may get up to 87 mm. in length.

- | | |
|---|---------------------------------------|
| 5. Superior manus keels absent | Keels of manus agranular but distinct |
| 6. Eight keels on caudal segment I | Ten keels |
| 7. Ratio of third marginal lamella length to length of second marginal lamella = 1.75 | = 2.06 |
| 8. Ratio of ampulla width to caudal segment width = 1.19 | = 1.00 |

DESCRIPTION. Entire animal light brown with variegated fuscous pattern; legs and chelicera somewhat lighter. Only pedipalps punctate.

PROSOMA: *Carapace*. Trapezium shape with posterior anterior taper of 0.50 mm./mm. of length. Anterior marginal notch at level of posterior margin of first pair of lateral eyes. Median ocular tubercle moderately prominent. Entire carapace with variegated pattern, with region of frontal lobes lighter and variegated fuscous band along anterior margin between lateral eyes. Surface shiny, smooth, agranular and sparsely hirsute. Median ocular furrows absent. Anterior median and lateral ocular furrows shallow and broad. Central median furrows deep and broad. Posterior median furrow deep and slit-like. Posterior marginal and posterior lateral furrows moderately deep and broad but not interconnected. Carapace length 1.01 times that of pedipalp tarsus. *Sternum*. Lateral sides subparallel. Basal triangular pit with deep, narrow, elongate apex which extends anteriorly over one-half the sternum length after which it fans out to form a somewhat diamond-shaped, flat, depressed area.

Pedipalps. *Tarsus* densely hirsute; with vestige of basal lobe. *Tibia* fixed finger densely hirsute. Trichobothrial pattern (fig. 1): $D_{1, 2, \text{ and } 3}$ form isosceles triangle with $D_{1, \text{ and } 3}$ equal to $D_{2, \text{ and } 3}$; $D_{4, 5, \text{ and } 6}$ form isosceles triangle with $D_{5, \text{ and } 6}$ equal to $D_{4, \text{ and } 6}$; $I_{2, 3, \text{ and } 4}$ in line. Manus interior distal two-thirds moderately hirsute; exterior surface lightly so and with punctate reticulum and agranular except for marginal keels. Exterior marginal keel bears large, somewhat confluent granules and interior marginal bears large, somewhat cone-shaped granules on distal half. Other keels vestigial. Trichobothrial pattern (fig. 2): $M_{1, 3, \text{ and } 5}$ in line; $M_{2, \text{ and } 4}$ distad to line between $M_{1, \text{ and } 5}$; $B_{3, 4, \text{ and } 5}$ form obtuse, isosceles triangle which contains a large granule within its area; $B_{1, 2, \text{ and } 3}$ almost in line. $E_{1, 3, \text{ and } 4}$ in line; $E_{2, 1, \text{ and } 3}$ form acute angle. *Patella* dorso-inner keel well developed and agranular. Ventro-inner keel vestigial but bearing widely spaced, large broad granules. Dorsal surface agranular and somewhat punctate. Inner surface with scattered, small granules and three very large, somewhat cone-shaped granules on dorso-proximad margin. Trichobothrial pattern (fig. 2): $P_{2, 6, 10, \text{ and } 11}$ and $P_{3, 8, \text{ and } 12}$ in line; $P_{7, 8, \text{ and } 9}$ form isosceles triangle; $V_{1, 2, \text{ and } 3}$ in line. *Femur* dorso-inner keel weak but irregularly covered with large, truncate granules. Dorso-exterior keel weakly developed and bearing a few large, broad granules. Ventro-inner keel weakly devel-

oped and bearing scattered, large truncate granules. Ventro-exterior keel vestigial and agranular. Dorsal surface sparsely granular. Inner surface densely and coarsely granular. Ventral surface sparsely granular with anterior portion bearing largest granules. Exterior surface agranular.

Walking legs. Tarsomeres moderately to densely hirsute with other segments lightly so. Agranular except for a few moderately large granules on inferior edge of femurs of legs I to III. Tarsomere spine formula: $\frac{3}{3}, \frac{3}{3}, \frac{4}{4}, \frac{4}{4}, \frac{5}{5}, \frac{5}{5}, \frac{5}{5}, \frac{5}{5}$.

OPISTHOSOMA: Mesosoma. *Tergites* smooth, agranular and only slight vestiges of keels. *Sternites* shiny, smooth and rather densely hirsute on lateral and posterior margins. VII bears two pair of vestigial lateral keels. Stigma subovular. *Genital operculum* subovular and undivided. *Pectines* with teeth 10/10; three or four small middle lamellae; free margin of basal middle lamellae forms about 130° angle with denticulate margin; fulcra medium sized, subtriangular. Third marginal lamellae 1.75 times as long as second. Posterior margin of basal piece convex but anterior margin bears broad, medium notch.

Metasoma. Intercarinal spaces agranular. Segments I through VI moderately hirsute; V densely so. Development of keels as follows: dorsal poorly developed, smooth and agranular on all segments; superior laterals vestigial on segments I through IV and absent on V; median laterals absent; inferior lateral keels moderately well developed and agranular on segment I, weakly developed on II, with only slight traces on III, IV, and V but bearing on V approximately five or six moderate sized, widely spaced, conical granules; inferior medians moderately developed but agranular on segment I, weakly developed and agranular on II, lacking on III, IV, and V but bearing on V about four to six moderately large, widely spaced, conical granules. Crescentic area definite but anterior margin outlined by irregular arrangement of large, conical granules and larger such granules on lateral margins. Anterior crest of anal arch with about eight to nine large, chisel-shaped granules plus two on each lateral terminus in line with lateral, crescentic granules. Posterior anal crest of anal arch agranular. *Telson* densely hirsute; agranular except for three clusters of large, conical granules near ventroproximal margin.

TYPES. *Holotype*, female, length 46.98 mm., AS no. 63-618, repository MCZ Harvard University, taken at San Jose del Cabo, Baja California del Sur, Mexico. Collected before 1950. No other data available. *Paratypes*, two females, lengths 46.8 mm. and 43.45 mm., AS nos. 63-616 and 63-617. Other data same as holotype.

Bioculus Stahnke, new genus

DIAGNOSIS. Two pair of lateral eyes, instead of three, differentiates this genus from all other diplocentrid genera except *Oculus* Simon, 1880. It differs from this genus as follows: *Bioculus* with median carapacial notch, exterior pedal

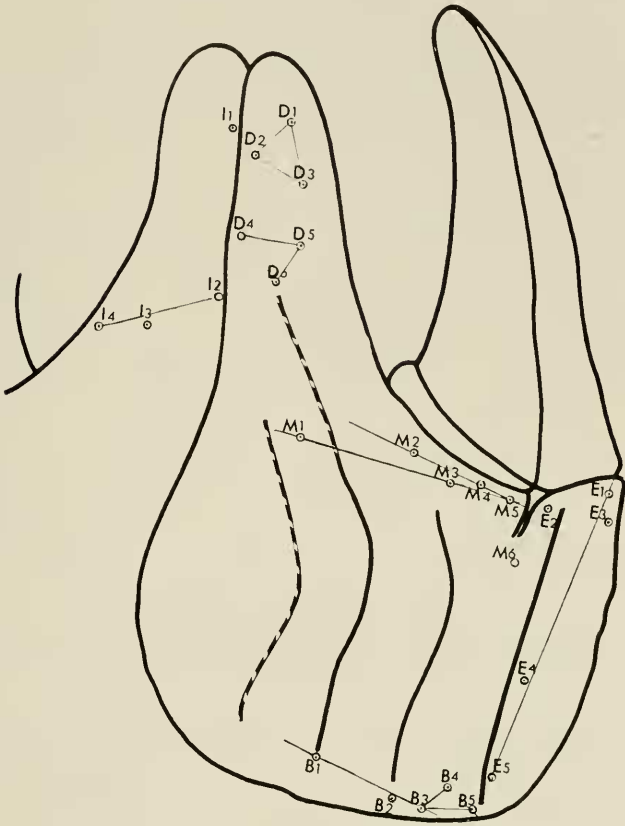


FIGURE 1. Schematic drawing of right pedipalp chela (*B. comondae*) showing keels of exterior surface and trichobothria (small circle "cup" and dot "base of hair").

spurs, tarsomere spine formulas $\frac{3}{3} \frac{3}{3}, \frac{4}{4} \frac{4}{4}, \frac{5}{5} \frac{5}{5}, \frac{5}{5} \frac{5}{5}$ and $\frac{4}{4} \frac{4}{4}, \frac{5}{5} \frac{5}{5}, \frac{6}{6} \frac{6}{6}, \frac{6}{6} \frac{6}{6}$, pectinal teeth 7 to 9 (female), 9 to 11 (male), trichobothrium I_3 either on or proximal to line between I_2 and 4. *Oculus* with anterior margin almost straight, no pedal spurs, tarsomere spine formula only $\frac{3}{3} \frac{3}{3}, \frac{4}{4} \frac{4}{4}, \frac{5}{5} \frac{5}{5}, \frac{5}{5} \frac{5}{5}$, pectinal teeth 6 (female), 7 (male), trichobothrium I_3 always distal to line between I_2 and 4.

Bioculus, like *Didymocentrus* but unlike *Diplocentrus*, without lateral tarsomere lobes. M_1 trichobothrium always on manus but in other two genera not so. Exterior marginal keel always diagonal but never extending farther than halfway between E_1 and 2. In other two genera this keel not always diagonal or when so, may extend to E_1 . Crescentic area of caudal segment V always present in *Bioculus*; sometimes lacking in other two genera. Posterior anal crest in *Bioculus* at most with one or two granules on lateral termini; sometimes completely granular in other two genera.

Pedipalps. Length of tarsus always definitely greater than width of manus. *Tibia* (fig. 1) with six (D) trichobothria on exterior surface; four (I) on inner surface. Manus bears 16 trichobothria (fig. 2): Six (M) on distal margin; five (B) on basal margin and five (E) on underhand. D group always organized in form of two triangles. M₁ on manus near base of fixed finger. B₃, 4, and 5 always forms triangle. E₂, 1, and 3 always forms acute angle. *Patella* (fig. 2) bears nineteen trichobothria: Three (A) dorso-inner margin; thirteen (P) postero-exterior surface; three (V) on ventro-exterior margin. P group arranged in proximal cluster of five; medial group arranged in double triangle and distal cluster of four; three of which form triangle. *Femur* bears three trichobothria: One on extreme proximal margin of dorso-inner edge; another short distance from proximal margin just above dorso-exterior edge; third just distal to second but below dorso-exterior edge.

Walking legs. Lateral lobes absent or represented by slight protrusion. Median lobes well developed and bear terminal macrochaete. Well developed pedal spur and lateral claws but median claws moderately developed.

OPISTHOSOMA: *Mesosoma*. Median keels of tergite always present as slight vestiges. Lateral keels on tergite VII never well developed and may exist as slight vestiges. *Sternites* always agranular and with pair of large, elongate depressions laterad. Stigmata elongate elliptical. *Genital operculum* subovular; male plates not united, with definite genital papillae; female plates united. Angle of free margin of basal middle lamellae of pectines formed with denticular margin always smaller on male than on female. Third marginal lamella generally longer than second.

Metasoma. Intercarinal spaces generally agranular. Dorsal furrow never strongly developed. Crescentic area always present. Anterior anal crest always bears broad, chisel-shaped granules. Posterior crest agranular or with several granules on lateral extremities. *Telson* agranular except for clusters of large granules near ventro-proximal margin. *Aculeus* short, sharply curved with large, blunt subaculear tubercle. Ampulla always wider than caudal segment V but narrower than caudal segment I. Ampulla width greater than depth.

TYPE SPECIES. *Bioculus comondae*, new species.

KEY TO THE GENUS *BIOCULUS*, NEW GENUS

- 1a. Tarsal spine formula: $\frac{4}{4} \frac{4}{4}, \frac{5}{5} \frac{5}{5}, \frac{6}{6} \frac{6}{6}, \frac{6}{6} \frac{6}{6}$ 2
- 1b. Tarsal spine formula: $\frac{3}{3} \frac{3}{3}, \frac{4}{4} \frac{4}{4}, \frac{5}{5} \frac{5}{5}, \frac{5}{5} \frac{5}{5}$ 5
- 2a (1a). Trunk and cauda concolorous, chestnut brown. Ratio of pedipalp tarsus length to manus width less than 1.20. Ratio between lengths of leg IV coxa and of pecten denticular margin less than 1.60 *B. cerralvensis*, new species (p. 285)
- 2b (1a). Trunk with distinct fuscous variegated pattern. Ratio of pedipalp tarsus length to manus width over 1.25. Ratio between lengths of leg IV coxa and of pecten denticular margin over 1.75 3

- 3a (2b). Greatest posterior width of carapace greater than its length. Pedipalp tarsus longer than carapace. Length of caudal segment V greater than carapace length *B. aguajensis*, new species (p. 281)
- 3b (2b). Greatest posterior width of carapace less than its length. Pedipalp tarsus shorter than carapace. Length of caudal segment V less than carapace length 4
- 4a (3b). Entire animal non-punctate. Ratio between lengths of carapace and caudal segment V greater than 1.30. Ratio of pecten basal piece width to length less than 1.35 *B. figghoblyni*, new species (p. 300)
- 4b (3b). Pedipalps distinctly punctate. Ratio between lengths of carapace and caudal segment V less than 1.20. Ratio of basal piece width to length greater than 1.45 *B. parrishi*, new species (p. 308)
- 5a (1b). Neither cauda nor pedipalps punctate. Ratio between lengths of carapace and caudal segment V greater than 1.30 6
- 5b (1b). At least pedipalps punctate. Ratio between lengths of carapace and caudal segment V less than 1.25 7
- 6a (5a). Ratio of distance between lateral eyes and diameter of first lateral eye over 0.80. Third marginal lamella as long as terminal tooth of pecten. Ratio of basal piece width to length over 1.60 *B. santoensis*, new species (p. 313)
- 6b (5a). Ratio of distance between lateral eyes and diameter of first lateral eye less than 0.45. Third marginal lamella longer than terminal tooth of pecten. Ratio of basal piece width to length less than 1.35 *B. belvederi*, new species (p. 283)
- 7a (5b). Pedipalps, mesosoma and cauda punctate. Ratio between lengths of carapace and caudal segment V less than 1.03 *B. cruzensis*, new species (p. 293)
- 7b (5b). Mesosoma not punctate. Ratio between lengths of carapace and caudal segment V greater than 1.06 8
- 8a (7b). Pedipalp and cauda densely punctate. Ratio of pecten terminal tooth and third marginal lamella lengths ranges from 1.00 to 1.05 9
- 8b (7b). Pedipalp, or only parts of it, lightly to densely punctate; cauda sparsely or nonpunctate. Ratio between lengths of pecten tooth and third marginal lamella either less than 0.89 or greater than 1.50 10
- 9a (8a). Ratio between lengths of leg IV trochanter and pecten denticular margin less than 1.35. Ratio between lengths of third marginal and second marginal lamellae greater than 1.50 *B. comondae*, new species (p. 288)
- 9b (8a). Ratio between lengths of leg IV trochanter and denticular margin greater than 1.70. Ratio between lengths of third marginal and second marginal lamellae less than 0.90 *B. danzantiensis*, new species (p. 297)
- 10a (8b). Only pedipalp chela sparsely punctate. Other structures non-punctate. Ratio between pecten basal piece width and length less than 1.00 *B. prolatio*, new species (p. 311)
- 10b (8b). Chela of pedipalps moderately to densely punctate. Other pedipalp segments lightly to densely punctate. Other structures lightly or non-punctate. Ratio between pecten basal piece width and length greater than 1.40 11
- 11a (10b). Pedipalps densely punctate; cauda and carapace sparsely so. Over-all color concolorous yellowish tan except for faint fuscous pattern on carapace *B. luteus*, new species (p. 304)

- 11b (10b). Pedipalp chela moderately punctate; cauda sparsely so and carapace non-punctate. Overall color light to dark brown with variegated, fuscous pattern on trunk and cauda or concolorous chestnut brown 12
- 12a (11b). Pedipalp chela moderately punctate; other segments sparsely so. Cauda non-punctate. Ratio between lengths of leg IV trochanter and pecten denticular margin greater than 2.25 *B. lindsayi*, new species (p. 301)
- 12b (11b). Entire pedipalp moderately punctate; cauda sparsely so or non-punctate. Ratio between lengths of leg IV trochanter and pecten denticular margin less than 1.80 13
- 13a (12b). Cauda sparsely punctate. Entire animal concolorous, leathery brown. Ratio of tarsus length to pedipalp manus width less than 1.10. Ratio of sternum length to width less than 1.00 *B. similis*, new species (p. 317)
- 13b (12b). Cauda non-punctate. Trunk dorsum and cauda light brown with variegated, fuscous pattern. Ratio of tarsus length to pedipalp manus width greater than 1.30. Ratio of sternum length to width greater than 1.20 *B. parraensis*, new species (p. 306)

***Bioculus aguajensis* Stahnke, new species.**

DIAGNOSIS. See diagnosis of *B. cerralvensis*.

DESCRIPTION. Trunk and cauda light chestnut brown with variegated fuscous pattern. Chelicera and legs concolorous yellowish tan. Chela of pedipalps two-toned; fingers darker brown than manus. Trunk ventor lighter than dorsum and concolorous. Pedipalp chela densely punctate; patella and femur lightly to moderately so. Caudal segment V moderately punctate; only scattered punctations in other segments.

PROSOMA: *Carapace*. Depth of anterior median notch (0.63 mm.) at level of anterior margin of second pair of lateral eyes. Median ocular tubercle moderately prominent, agranular with brown, variegated pattern and flanked laterally by two elongated light spots. Entire carapace with indistinct brown, variegated pattern, with essentially clear areas on moderately developed frontal lobes and very, faint variegated, brown band along anterior margin between lateral eyes; moderately hirsute; agranular except for patches of very small granules laterad and anteriorly with scattered, large granules along anterior margin. Carapace length 0.84 times that of pedipalp tarsus. Median ocular furrow lacking. Anterior median furrow vestigial; lateral ocular furrow broad and shallow; median central furrow moderately deep but broad; posterior median and posterior marginal furrows deep and slit-like; latter *not* continuous with the moderately well developed posterior lateral furrows. *Sternum*. Lateral sides converging posteriorly. Basal triangular pit with vertical sides and narrow, but not slit-like, apex extending anteriorly over about one-half sternum length and fanning out into a depressed, flat, diamond-shaped area covering posterior half. Length 1.30 times width.

Pedipalps. *Tarsus* densely hirsute with broad, low basal lobe which does not bear unusually large granules; edge not scalloped. Distal one-fifth of inner

surface with nine lateral granules in clusters of 2, 3, 4; in first cluster second granule much larger than other one and larger than other seven. *Tibia*. Trichobothrial pattern (fig. 2): D_4 distal to D_5 ; $D_{1, 2, \text{ and } 3}$ form scalene triangle; $D_{4, 5, \text{ and } 6}$ form isosceles triangle with $D_{4, \text{ and } 5}$ equal to $D_{4, \text{ and } 6}$; I_3 proximal to straight line between $I_{2, \text{ and } 4}$. Manus interior distal one-third densely hirsute; this extends laterally on both sides. Exterior surface lightly to moderately hirsute. Interior surface covered with small to large granules. Exterior surface agranular except for lateral areas. Both surfaces with reticulum of punctations but not costate. Keels absent except weakly developed interior and exterior marginals with coarse granules. Trichobothrial pattern (fig. 1): $M_{2, 3, \text{ and } 4}$ distal to line between $M_{1, \text{ and } 5}$; M_3 proximal to line between $M_{1, \text{ and } 4}$; $B_{1, 2, \text{ and } 3}$ in line; very large lobate granules between $B_{4, \text{ and } 5}$; $B_{3, 4, \text{ and } 5}$ form scalene triangle; $E_{1, 3, \text{ and } 4}$ in line. *Patella* dorso-inner keels well developed but agranular. Ventro-inner keel weakly developed but bearing row of large, low granules. Ventro-exterior keel moderately developed and bearing large, confluent granules; other keels vestigial. Dorsal surface moderately punctate, largely agranular except for confluent, large granules at each end. Inner surface covered with fine to small granules and bearing 3 to 4 large cone-shaped granules on dorsal proximal margin. Exterior surface agranular except for some large, low granules; moderately punctate. Trichobothrial pattern (fig. 3): $P_{1, 2, \text{ and } 3}$ form isosceles triangle with $P_{1, \text{ and } 2}$ equal to $P_{1, \text{ and } 3}$; no three of $P_{2, 6, 10, \text{ and } 11}$ in line; $P_{3, 8, \text{ and } 12}$ in line; $P_{5, 7, \text{ and } 8}$ and $P_{3, 7, \text{ and } 13}$ not in line; $P_{6, 7, \text{ and } 8}$ form isosceles triangle with $P_{6, \text{ and } 7}$ equal to $P_{7, \text{ and } 8}$; $P_{7, 8, \text{ and } 9}$ form isosceles triangle with $P_{7, \text{ and } 8}$ equal to $P_{7, \text{ and } 9}$; $P_{6, 7, \text{ and } 9}$ form obtuse isosceles triangle with $P_{6, \text{ and } 7}$ equal to $P_{7, \text{ and } 9}$; $V_{1, 2, \text{ and } 3}$ almost in line. *Femur*. Dorso-inner keel weak but covered with irregularly arranged, large, more or less truncated conical granules. Dorso-exterior keel weakly developed and bearing few large granules. Ventro-inner keel weakly developed but bearing widely spaced, large somewhat truncated granules. Ventro-exterior keel absent and agranular. Dorsal surface with scattered, coarse granules. Inner surface very densely covered with small to large granules. Ventral surface with some small granules. Exterior surface somewhat punctate, agranular except for some, low confluent granules.

Walking legs. Moderately hirsute and agranular except for some fairly large granules on inferior edge of femurs; these granules most abundant on legs I and II. Tarsomere formula: $\frac{4}{3} \frac{4}{4}, \frac{5}{5} \frac{5}{5}, \frac{6}{6} \frac{6}{6}, \frac{6}{6} \frac{6}{6}$.

OPISTHOSOMA: *Mesosoma*. *Tergites* smooth, agranular with scattered patches of very fine granules except large lateral granules on VII. Vestiges of two pair of lateral keels on VII. Scattered bristles along lateral and posterior margins of all tergites. *Sternites* shiny, smooth and moderately to densely hirsute. Slight vestiges of lateral keels on VII. *Genital operculum* anterior margin protruding slightly more than opposite side. *Pectines* with teeth 9/9; densely hirsute; three

or four small middle lamellae; moderately large subtriangular fulcra. Third marginal lamella length 1.23 times that of second. Basal piece with straight posterior margin but anterior margin has broad median notch.

Metasoma. Intercarinal spaces agranular except for several scattered granules. Segments I–IV very lightly hirsute; V moderately so on ventral surface. Dorsal furrows fairly well developed on segments I–IV. Dorsal keels not prominent but bear tolerably large, widely spaced, somewhat conical granules. Superior lateral keels vestigial on segments I–IV but I and II have several scattered, moderately large granules; weakly developed but bearing many large granules on V. All other keels vestigial on all segments. Vestiges of inferior and median laterals most noticeable on segments I and II; inferior laterals of V with scattered, moderately large conical granules. Crescentic area well developed and elongate but proximal margin outlined by irregularly arranged, large conical granules; lateral granules widely spaced, in linear order and sharply differentiated from the anterior anal crest granules. Posterior crest of anal arch agranular. *Telson* ventor moderately to densely hirsute; three clusters of 3:2:3 very large granules along ventro-proximal margin.

TYPE. *Holotype*, female, length 58.6 mm., Parrish no. 176, taken 15 April 1962 by George Lindsay in Arroyo Aguaje, Isla Cerralvo, Baja California de Sur, Mexico. Repository: California Academy of Sciences, Type no. 9549.

***Bioculus belvederi* Stahnke, new species.**

DIAGNOSIS. See *B. santoensis*, and *B. danzantiensis*.

DESCRIPTION. Trunk and cauda light brown; manus of pedipalp chela, legs and manus of chelicera lighter brown. Entire animal with distinct, fuscous variegated pattern except chela of pedipalps. No structures punctate.

PROSOMA: *Carapace*. Depth of anterior median notch (0.17 female; 0.13 male) at level of posterior one-third diameter of first pair of lateral eyes. Median ocular tubercle agranular with dark, variegated pattern and flanked laterally by two elongated light spots. Entire carapace with variegated, fuscous pattern; agranular; sparsely hirsute; lighter areas on weakly developed frontal lobes and with contrasting, fuscous band with variegated pattern along anterior margin between lateral eyes. Median ocular furrows lacking. Anterior median, lateral ocular and central median furrows broad but distinct. Posterior median and posterior marginal furrows deep but not distinctly slit-like. Latter *not* continuous with broad but well developed posterior lateral furrows. Carapace length 1.22 times that of pedipalp tarsus. *Sternum*. Lateral sides converging posteriorly. Basal triangular pit without vertical sides, but with broad apex extending one-fifth length of sternum and then expanding into flat, undepressed, diamond-shaped area. Length 1.34 (female) and 1.31 (male) times width.

Pedipalps. *Tarsus* densely hirsute; with slight trace of basal lobe. Distal fifth

of inner surface bearing four large, lateral granules in clusters of 2, 2. *Tibia* fixed finger densely hirsute. Trichobothrial pattern (fig. 1): $D_{1, 2, \text{ and } 3}$ and $D_{4, 5, \text{ and } 6}$ form isosceles triangles with $D_{1, \text{ and } 2}$ equal to $D_{2, \text{ and } 3}$ and $D_{4, \text{ and } 5}$ equal to $D_{4, \text{ and } 6}$; D_4 proximad to D_5 ; distal edge of I_3 cup touching line between $I_{2, \text{ and } 4}$. Manus interior and exterior lightly hirsute. No costate or punctate reticulum; no exterior pigment reticulum. Agranular except for widely separated large, dark granules on distal half of interior marginal keel. Exterior marginal keel strongly developed, and bearing several indistinct confluent granules. Other keels vestigial, agranular and without pigment representation. Exterior surface convexity spread uniformly through the three central keels. Trichobothrial pattern (fig. 1): $M_{1, 2, \text{ and } 4}$ and $M_{1, 3, \text{ and } 5}$ in line (female); (male) $M_{1, 3, \text{ and } 4}$ in line; $M_{2, 3, \text{ and } 4}$ distinctly distal to line between $M_{1, \text{ and } 5}$; distal edge (female) of B_2 cup not touching line between $B_{1, \text{ and } 3}$; $B_{1, 2, \text{ and } 3}$ (male) in line; $B_{3, 4, \text{ and } 5}$ form isosceles triangle with $B_{3, \text{ and } 4}$ equal to $B_{4, \text{ and } 5}$; $E_{1, 3, \text{ and } 5}$ in line. *Patella* dorso-inner keel weakly developed but agranular. Dorso-exterior keel vestigial and agranular. Ventro-inner keel weakly developed and bearing only one or two, indistinct broad, low granules. Ventro-exterior keel weak and agranular. Inner surface densely covered with fine to small granules and bearing cluster of three to four granules on dorso-proximal marginal prominence. Ventral surface agranular. Dorsal and exterior surfaces agranular. Trichobothrial pattern (fig. 2): $P_{1, 2, \text{ and } 3}$ form scalene triangle; $P_{2, 6, \text{ and } 10}$ almost in line; $P_{6, 10, \text{ and } 11}$ in line; $P_{3, 8, \text{ and } 12}$ and $P_{5, 7, \text{ and } 8}$ in line; $P_{4, 9, \text{ and } 13}$ almost in line; $P_{6, 7, \text{ and } 8}$ form isosceles triangle with $P_{6, \text{ and } 7}$ equal to $P_{6, \text{ and } 8}$; $P_{7, 8, \text{ and } 9}$ form isosceles triangle with $P_{7, \text{ and } 9}$ equal to $P_{8, \text{ and } 9}$; $P_{6, 7, \text{ and } 9}$ form scalene triangle; $V_{1, 2, \text{ and } 3}$ not in line. *Femur* dorso-inner keel moderately developed and bearing several large granules. Dorso-exterior keel weakly developed and agranular. Ventro-inner keel moderately developed and bearing four or five widely spaced, very large, dark, broad granules. Ventro-exterior keel vestigial and agranular. Dorsal surface convex at proximal two-thirds and essentially agranular. Inner surface covered with small granules. Exterior and ventral surfaces agranular.

Walking legs. Lightly to moderately hirsute. Agranular. Tarsomere spine formula: $\frac{3}{3} \frac{3}{3} \frac{4}{4} \frac{4}{4} \frac{5}{5} \frac{5}{5} \frac{5}{5}$.

OPISTHOSOMA: Mesosoma. All *tergites* sparsely hirsute, shiny, agranular and keelless. *Sternites* shiny and moderately hirsute. VII with agranular vestiges of lateral keels. *Genital operculum* posterior and anterior margin protrusions subequal on female but on male anterior margin protrudes more than posterior. *Pectines* with teeth 8/8 (female) and 9/10 (male; three distinct, subcircular middle lamellae; moderately large subtriangular fulcra. Basal piece with straight posterior margin but anterior margin has broad, shallow median notch. Third marginal lamella length 1.17 (male) and 1.33 (female) times that of second.

Metasoma. Dorsal furrow very shallow on I–IV; absent on V. Dorsal keels vestigial and agranular. Superior lateral and median keels essentially absent and agranular. On female inferior laterals well developed and with confluent granules on segments I and II, vestigial and agranular on III, absent on IV and V; inferior medians moderately developed with confluent granules on I and II, absent and agranular on III–V. Inferior laterals and median of segment I on male moderately developed and agranular; vestigial and slightly granular on II; absent and agranular on III and IV, absent on V but medians agranular and laterals with two or three large granules distad. All keels represented by irregular, fuscous stripes. Crescentic area depressed, about as broad as long; even row of granules delimit area anteriorly and laterally and extending to lateral termini of anal arch as several large, denticulate granules which on female broader and flatter. Anterior crest of anal arch with six to seven granules not continuous with lateral, terminal granules. Posterior crest agranular except for single, large, cone-shaped granule on each lateral terminus. All segments moderately to densely hirsute. Telson ventral and lateral surface moderately hirsute; clusters of 2, 2, 2, or 3, 2, 3 large granules near ventro-proximal margin. Subaculear tubercle distal edge forms about an 80° angle with telson surface.

TYPES. *Holotype*, female, length 21.34 mm., Parrish no. 150B, taken 7 April 1962 by members of Belvedere Expedition, Isla Danzanti, Baja California del Sur, Mexico. *Allotype*, male, length 17.97 mm., Parrish no. 150C. Other data same as for holotype. Repository: California Academy of Sciences, Type no. 9550.

***Bioculus cerralvensis* Stahnke, new species.**

(Figures 2, 3.)

DIAGNOSIS. Holotype of *B. aguajensis* approximately same size as that of this species, of opposite sex but from same island. Differs in following respects:

| <i>B. cerralvensis</i> | <i>B. aguajensis</i> |
|---|--|
| 1. Pedipalp and cauda densely and conspicuously punctate | Punctations moderate to light |
| 2. Concolorous dark, chestnut brown | Trunk and cauda light chestnut brown with variegated fuscous pattern |
| 3. Ratio of <i>distance</i> from line tangent to anterior margin to anterior edge of median eyes to <i>depth</i> of anterior median notch = 6.8 | = 4.8 |
| 4. Ratio of <i>distance</i> between lateral eyes to <i>diameter</i> of first pair of lateral eyes = 1.33 | = 0.43 |
| 5. Carapacial taper determined by dividing <i>difference</i> between great- | |



3

FIGURE 3. 1855.4 *Bioculus cerralvensis* Stahnke, ♂, holotype.

- est posterior width and anterior width by carapace *length* = 0.37 = 0.50
6. Ratio of *distance* from line tangent to posterior margin to posterior edge of median eyes to *distance* from line tangent to anterior margin to anterior edge of median eyes = 1.52 = 1.42
7. Ratio of *length* of leg IV coxa to *length* of margin covered by pectinal teeth = 1.30 = 2.13
8. Trichobothrial patterns D_{4, 5, and 6}, P_{6, 7, and 8}, P_{7, 8, and 9}, P_{6, 7, and 9} form scalene triangles Form isosceles triangles

DESCRIPTION. Trunk dorsum, cauda, chelicera, and pedipalps concolorous dark chestnut brown and quite granular; legs lighter brown. Trunk ventor concolorous light brown. Cauda and pedipalps densely and coarsely punctate.

PROSOMA: *Carapace*. Depth of anterior median notch (0.38 mm.) at level of posterior margin of first pair of lateral eyes. Median ocular tubercle prominent, with indistinct confluent granules. Entire surface densely covered with fine

granules; coarse granules along anterior margin with clusters of larger ones in area of lateral eyes. Very sparsely hirsute. Frontal lobes well developed. Median ocular furrow lacking. Anterior median furrow vestigial. Lateral ocular furrows well developed. Median central furrow broad and moderately deep. Posterior median and posterior marginal furrows deep and slit-like; latter continuous with well developed posterior lateral furrows. Carapace length 0.84 times that of pedipalp tarsus. *Sternum*. Lateral sides subparallel. Basal triangular pit that has vertical sides, narrow but not slit-like apex extending anteriorly about one-half sternum length and fanning out into depressed, flat, diamond-shaped area covering about posterior half. Length 1.18 times width.

Pedipalps. *Tarsus* densely hirsute; with broad, low basal lobe which does not bear unusually large granules; edge not markedly scalloped. Distal one-fifth of inner surface bearing eight large, lateral granules in clusters of 2, 2, 2, 2; in first, second and fourth clusters one granule about twice as large as other. *Tibia* trichobothrial pattern (fig. 1): D_4 distal to D_5 ; $D_{1,2, \text{ and } 3}$ and $D_{4,5, \text{ and } 6}$ form scalene triangles; I_3 proximal to line between $I_{2, \text{ and } 4}$. Manus interior distal one-third densely hirsute; this extends laterally on both sides. Exterior surface lightly to tolerably hirsute. All surfaces with small to large, coarse granules with heavy concentration of granules on each lateral margin. Both interior and exterior surface with coarse, punctate reticulation; somewhat costate. Keels absent except vestigial superior digital and superior exterior keels as well as moderately developed external marginal keel and interior marginal, both of which bear somewhat irregularly arranged, large coarse granules. Trichobothrial pattern (fig. 1): $M_{2,3, \text{ and } 4}$ distal to line between $M_{1, \text{ and } 5}$; M_3 proximad to line between $M_{1, \text{ and } 4}$; B_2 approximately in line with $B_{1, \text{ and } 3}$; scalene triangle formed by $B_{3,4, \text{ and } 5}$ encloses large truncate, conical granule; $E_{1,3, \text{ and } 4}$ not in line. *Patella* dorso-inner keels well developed but agranular. Dorso-exterior keels weak but bearing large, confluent granules. Ventro-inner keel weakly developed but covered with broad, coarse granules. Ventro-exterior keel weakly developed and smooth. Dorsal surface densely punctate and bearing confluent granules. Inner surface densely covered with fine to small granules and bearing three or four very large granules on dorsal proximal margin. Exterior surface moderately covered with coarse but confluent granules and covered by punctate reticulum. Trichobothrial pattern (fig. 2): $P_{1,2, \text{ and } 3}$ form isosceles triangle with $P_{1, \text{ and } 2}$ equal to $P_{1, \text{ and } 3}$; $P_{2,6,10, \text{ and } 11}$, $P_{3,8, \text{ and } 12}$ and $P_{4,9, \text{ and } 13}$ almost in line; $P_{5,7, \text{ and } 8}$ and $P_{3,7, \text{ and } 13}$ in line; $P_{6,7, \text{ and } 8}$, $P_{7,8, \text{ and } 9}$, $P_{6,7, \text{ and } 9}$ form scalene triangles; $V_{1,2, \text{ and } 3}$ not in line. *Femur* dorso-inner keel weak but covered with very large, irregularly arranged granules. Dorso-exterior keel weakly developed and bearing moderate to very large, irregularly arranged granules. Ventro-inner keel weakly developed but bearing very large granules. Ventro-exterior keel weakly developed with only small to medium sized granules. About proximal two-thirds of dorsal surface coarsely granular.

Inner surface densely covered with moderate to very large granules. Ventral surface densely granular. Exterior surface well covered with low, broad and somewhat confluent granules.

Walking legs. Slightly hirsute and almost agranular except for some moderately large granules on inferior edge of femur; these granules more abundant on femurs of legs I and II. Tarsomere spine formula: $\frac{4}{4}, \frac{4}{4}, \frac{5}{5}, \frac{5}{5}, \frac{6}{6}, \frac{6}{6}, \frac{6}{6}, \frac{6}{6}$.

OPISTHOSOMA: Mesosoma. *Tergites* densely covered with very fine granules interspersed with several larger ones except on tergite VII which bears clusters of rather large granules laterad to two pair of moderately well developed lateral keels. *Sternites* shiny, smooth and very lightly hirsute; slight vestiges of lateral keels on sternite VII. *Genital operculum* anterior margin protruding slightly more than opposite side; conspicuous genital papillae. *Pectines* with teeth 11/11; very lightly hirsute; four or five small, middle lamellae. Fairly large, subtriangular fulcra. Third lamella length 1.24 times that of second. Basal piece with straight posterior margin but bearing broad, median notch on anterior margin.

Metasoma. Intercarinal spaces agranular except for several scattered granules on segments I and V. All segments very lightly hirsute. Dorsal furrows moderately well developed on segments I through IV. Dorsal keels not prominent but bear moderately large, widely spaced, somewhat conical granules. Superior lateral keels vestigial on segments I through IV with some scattered, fairly large granules. Remaining segments very lightly granular. Other keels vestigial on all segments. Median lateral keels represented by some large granules on segments I and II; lacking on III through V. Vestiges of inferior median keels most noticeable on segment I with only slight traces on II through IV but represented almost entire length by widely separated, very large granules on V. Crescentic area well developed and elongate but proximal margin outlined by irregularly arranged, large conical granules with larger, denticulate, widely spaced granules on lateral margin. Anterior crest with about seven granules. Posterior crest of anal arch agranular. *Telson* lightly hirsute except on subaculear tubercle; clusters of 3:2:3 very large granules along ventro-proximal margin. Subaculear tubercle sloped toward aculeus.

TYPE. *Holotype*, male, length 53.2 mm., AS no. 1855.4, taken 21 March 1953 by J. P. Figg-Hoblyn on Isla Cerralvo, Baja California del Sur, Mexico. Repository: California Academy of Sciences, Type no. 9551.

***Bioculus comondae* Stahnke, new species.**

(Figures 1, 4, 5, 6, 7.)

DIAGNOSIS. Localities of *B. parraensis*, and this species relatively close. Differences between female specimens as follows:

B. parraensis

1. Color: light brown
2. Pedipalps moderately punctate; cauda non-punctate
3. Anterior median and median ocular furrows vestigial
4. Pecten teeth: 8/8
5. Trichobothrial patterns;
 - a) $D_{1, 2, \text{ and } 3}$ and $D_{4, 5, \text{ and } 6}$ form isosceles triangles
 - b) $M_{1, 2, \text{ and } 4}$ in line
 - c) $B_{3, 4, \text{ and } 5}$ and $P_{1, 2, \text{ and } 3}$ form scalene triangles
6. Ratio of *distance* from line tangent to anterior margin to anterior edge of median eyes to *depth* of anterior median notch = 6.8
7. Ratio of *length* of leg IV coxa to *length* of pectinal dentate margin = 1.77
8. Ratio of pecten basal piece *width* to *length* = 1.47

B. comondae

- Dark chestnut brown
- Pedipalps and cauda densely punctate
- Well developed
- 7/7
- Form scalene triangles
- Not in line
- Form isosceles triangles
- = 5.4
- = 1.31
- = 1.78

DESCRIPTION. Trunk, cauda and pedipalps dark, chestnut brown; legs and chelicera lighter brown; pedipalps with reddish tinge. Distinct, fuscous, variegated pattern on trunk, chelicera, legs and pedipalp patella and humerus; less distinct on cauda and absent on pedipalp chela. Pedipalps and cauda densely punctate; other structures lightly punctate or non-punctate.

PROSOMA: *Carapace*. Depth of anterior median notch (male 0.40 mm.; female 0.33 mm.) at level of anterior margin of second pair of lateral eyes. Median ocular tubercle not prominent, agranular, with fuscous variegated pattern and flanked laterally by two elongate, light spots. Entire carapace with fuscous variegated pattern but essentially clear areas on the moderately developed frontal lobes and distinct, variegated, fuscous band along anterior margin between lateral eyes; lightly hirsute. Male with patches of very dense, fine granules laterally and postero-laterally; female shiny and agranular. Anterior median and median ocular furrows broad but distinct. Well developed lateral ocular furrows give recessed effect to median ocular tubercle. Central median furrow broad but well developed. Posterior median furrow narrow, deep, slit-like. Posterior marginal furrow narrow, deep but not slit-like; *not* continuous with well developed postero-lateral furrows. In general, furrows not quite as well developed on female. Carapace length same as that of pedipalp tarsus (male



FIGURE 4. 1862.1 *Bioculus comondae* Stahnke, ♂, holotype, dorsal aspect, type species.

FIGURE 5. 1862.1 *Bioculus comondae* Stahnke, ♂, holotype, ventral aspect, type species.

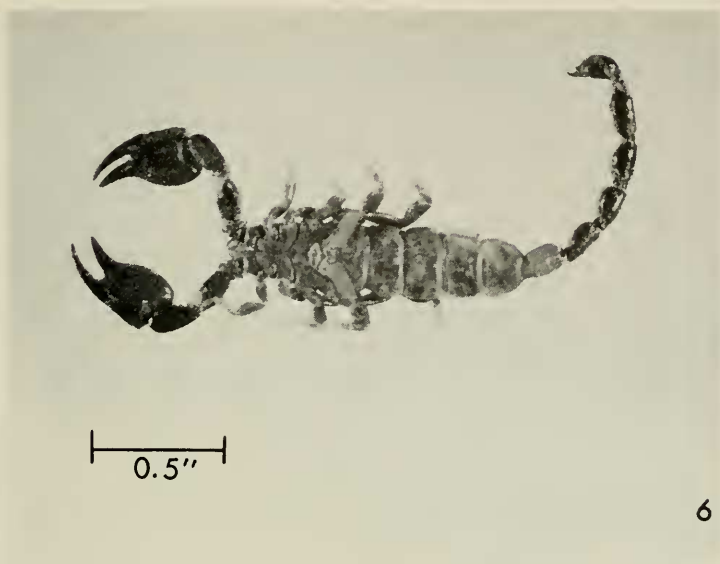


FIGURE 6. 1862.2 *Bioculus comondae* Stahnke, ♀, allotype, dorsal aspect, type species.

FIGURE 7. 1862.2 *Bioculus comondae* Stahnke, ♀, allotype, ventral aspect, type species.

and female). *Sternum*. Lateral sides posteriorly diverging (male) or subparallel (female). Basal triangular pit without vertical sides; broad apex widening at about one-third sternum length to depressed, flat, diamond-shaped area.

Pedipalps. *Tarsus* densely hirsute with slight trace of basal lobe. Distal fifth of inner surface bearing seven large, lateral granules in clusters of 2, 2, 3; the last cluster arranged linearly. *Tibia* fixed finger densely hirsute. Trichobothrial pattern (fig. 1): $D_{1,2, \text{ and } 3}$ and $D_{4,5, \text{ and } 6}$ form scalene triangles; D_4 is distad to D_5 ; I_3 distinctly proximal to line between $I_{2, \text{ and } 4}$. Manus interior distal one-third and lateral areas densely hirsute; exterior lightly so. Male with distinct costate reticulations, female lightly so. Exterior surface irregular but agranular except for a broad area of large granules along inner and exterior marginal keels. Punctations form an indefinite reticulum. Exterior marginal keel very strongly developed but agranular. Interior marginal keel weaker but bears numerous, large granules over distal two-thirds on male but female has only about four to six large granules on distal portion. Superior exterior keel moderately developed. On female, other keels vestigial or absent. On male, superior digital keel weakly developed and vestige extends onto base of fixed finger; superior inner secondary keel vestigial. Exterior surface most convex in region of superior digital and superior exterior keels. Trichobothrial pattern (fig. 1): $M_{2,4, \text{ and } 5}$ in line; M_3 proximal and M_4 distal to line between $M_{1, \text{ and } 5}$; $B_{3,4, \text{ and } 5}$ form isosceles triangle with $B_{3, \text{ and } 4}$ and $B_{4, \text{ and } 5}$ equal; B_2 proximal to line between $B_{1, \text{ and } 3}$; $E_{2,1, \text{ and } 3}$ form acute angle; $E_{3, \text{ and } 4}$ on opposite sides of line between $E_{1, \text{ and } 5}$. *Patella* dorso-inner keel well developed but agranular. Dorso-exterior and ventro-exterior keels vestigial and agranular. Ventro-inner keel weakly developed but bearing some moderately large, broad granules. Dorsal surface of male with a few large, broad granules; female agranular. Inner surface densely covered with very fine granules and bearing about three large granules on dorso-proximal margin. Ventral surface essentially agranular. Exterior surface of male essentially agranular; male bearing large, confluent granules. Trichobothrial pattern (fig. 2): $P_{1,2, \text{ and } 3}$ form isosceles triangle with $P_{1, \text{ and } 2}$ equal to $P_{1, \text{ and } 3}$; $P_{2,6,10, \text{ and } 11}$ not in line; $P_{3,8, \text{ and } 12}$ in line; $P_{4,9, \text{ and } 13}$ almost in line; $P_{5,7, \text{ and } 8}$ almost in line; $P_{3,7, \text{ and } 13}$ not in line; $P_{6,7, \text{ and } 8}$, $P_{7,8, \text{ and } 9}$ and $P_{6,7, \text{ and } 9}$ form scalene triangles; $V_{1,2, \text{ and } 3}$ not in line. *Femur* dorso-inner and ventro-inner keels weakly developed but irregularly covered with large, coarse granules. Other keels vestigial and agranular. Dorsal surface with about proximal half to two-thirds covered by small to medium sized granules. Inner surface densely covered with moderately large to very large granules. Ventral surface densely covered proximad with fine to fairly large granules. Exterior surface lightly granular.

Walking legs. Lightly to moderately hirsute with greatest concentration on tibia and tarsomeres. Agranular except for small granules on lateral surface and large granules on ventral edge of femur. Tarsomere spine formula: $\frac{3}{3} \frac{3}{3}, \frac{1}{4} \frac{4}{4}, \frac{5}{5} \frac{5}{5}, \frac{5}{5} \frac{5}{5}$.

OPISTHOSOMA: *Mesosoma*. Tergites of male densely covered with very fine granules; female agranular and moderately punctate. Tergite VII on male with vestigial lateral keels and clusters of small to moderate sized granules; female keelless and agranular. Lightly hirsute. Sternites with all segments moderately hirsute on lateral and posterior margins. VII bears slight vestiges of two pair of lateral keels and essentially agranular. Genital operculum anterior margin on male protrudes much more than posterior margin; female both subequal. Pectines with teeth 7/7 (female) and 10/9 (male); male with four small subcircular middle lamella; female with two; moderately to densely hirsute; with large, subtriangular fulcra. Basal piece with slightly convex posterior margin but anterior margin with broad, median notch; deeper on male. Third marginal lamella length 1.55 (male) and 1.60 (female) times that of second.

Metasoma. Dorsal furrow weakly developed on segments I through IV; absent on V. Dorsal and superior lateral keels essentially absent and agranular. Slight vestiges of median lateral keels on segment I; lacking on all other segments. Inferior lateral keels moderately well developed and bearing confluent granules on I and II; absent on III and IV; weakly developed on V and bearing several large granules. Inferior median keels well developed and essentially agranular on I; weakly developed and agranular on II; slight vestiges on III; absent on IV; slight vestige and several broad granules on V. Crescentic area distinct, longer than broad with anterior margin bearing irregularly arranged cone-shaped granules and laterally with chisel-shaped granules. Anterior crest of anal arch with six to nine granules plus two large denticulate granules (male) on lateral terminus; female terminal granules appear worn down and look like one broad granule. Posterior crest agranular except for one large granule on each lateral terminus. All caudal segments lightly hirsute. Telson ventral and lateral areas moderately hirsute; clusters of 3, 2, 3 large granules near ventro-proximal margin. Subaculear tubercle distal edge forms about a 90° angle with telson surface.

TYPES. *Holotype*, male, length 41.65 mm., AS no. 1862.1, taken July 22, 1938 by Ross and Michelbacher at Comondu, Baja California del Sur, Mexico. *Allotype*, female, length 37.41 mm., AS no. 1862.2, data same as for AS no. 1862.1. Repository: California Academy of Sciences, Type no. 9552.

***Bioculus cruzensis* Stahnke, new species.**

(Figures 8, 9.)

DIAGNOSIS. Both holotype of *B. lindsayi*, and of *B. prolatio* (females) from same island as this species (male) which to unaided eye looks black; other two medium brown. Differences between these two and *B. cruzensis* not attributable merely to sexual dimorphism. Considerable differences in ratios and trichobothrial patterns. A comparison of several *B. cruzensis* ratios with those of *B. prolatio* will suffice:



8



9

FIGURE 8. 1856.2 *Bioculus cruzensis* Stahnke, ♂, holotype, dorsal aspect.

FIGURE 9. 1856.2 *Bioculus cruzensis* Stahnke, ♂, holotype, ventral aspect.

| <i>B. cruzensis</i> | <i>B. prolatio</i> |
|---|--------------------|
| 1. Ratio of <i>distance</i> between median eyes to <i>diameter</i> of median eye = 0.78 | = 1.00 |
| 2. Ratio of carapace <i>length</i> to caudal segment V length = 1.01 | = 1.19 |
| 3. Ratio of <i>length</i> of leg IV coxa to <i>length</i> of pectinal dentate margin = 1.35 | = 2.22 |
| 4. Ratio of genital operculum <i>width</i> to <i>length</i> = 1.92 | = 2.51 |
| 5. Ratio of pecten basal piece <i>width</i> to <i>length</i> = 2.11 | = 0.97 |

DESCRIPTION. Entire animal dark chestnut brown with variegated, fuscous pattern distinct on legs but indistinct on other areas. To unaided eye entire animal appears black. Carapace, cauda, pedipalps and legs densely punctate.

PROSOMA: *Carapace*. Depth of anterior median notch (0.55 mm.) beyond level of posterior margin of first pair of lateral eyes. Median ocular tubercle prominent, posterior slope densely granulated, same dark color as carapace but with slight trace of elongated flanking clear areas. Entire carapace dark brown with slight indication of light areas but well developed frontal lobes and anterior margin same dark color. Moderately coarse granules along anterior margin and extending laterad to posterior margin. Anterior median furrow shallow but distinct. Definite median ocular furrow. Lateral ocular furrow broad and shallow. Central median furrow broad and shallow but continues abruptly into narrow, slit-like posterior median and marginal furrows. Latter distinctly *not* continuous with well developed posterior lateral furrows. Carapace length 0.90 times that of pedipalp tarsus. *Sternum*. Lateral sides subparallel. Basal triangular pit without vertical sides and with relatively narrow apex extending anteriorly about one-third sternum length and fanning out into depressed, flat, diamond-shaped area covering posterior half.

Pedipalps. *Tarsus* densely hirsute; without basal lobe. Distal fifth of inner surface bearing seven large lateral granules in clusters of 2, 2, 3. *Tibia* fixed finger densely hirsute. Trichobothrial pattern (fig. 1): $D_{1, 2, \text{ and } 3}$ form isosceles triangle with $D_{1, \text{ and } 2}$ equal to $D_{2, \text{ and } 3}$; $D_{4, 5, \text{ and } 6}$ form scalene triangle; D_4 is distad to D_5 . $I_{2, 3, \text{ and } 4}$ in line. Manus interior distal one-third moderately to densely hirsute; exterior surface lightly hirsute. Both interior and exterior surface densely and coarsely granular. Exterior surface bears many coarse, confluent granules. Both surfaces with coarse punctate reticulum. Exterior marginal keel well developed, covered with large, broad granules. Superior exterior secondary keel vestigial but coarsely granular. Superior exterior keel

well developed and bearing large confluent granules. Superior digital keel well developed, covered with broad confluent granules and extends to base of fixed finger. Superior inner secondary keel vestigial and bearing broad confluent granules. Interior marginal keel well developed and covered with numerous very large granules. Trichobothrial pattern (fig. 1): M_3 in line with $M_{1, \text{and } 5}$; M_2 cup touching this line; B_2 proximal to line between $B_{1, \text{and } 3}$; very large granule within scalene triangle formed by $B_{3, 4, \text{and } 5}$; $E_{1, 4, \text{and } 5}$ in line. *Patella* dorso-inner keel strongly developed and covered with large, confluent granules. Dorso-exterior keel well developed and bearing confluent granules. Ventro-exterior keel well developed and bearing indefinite, confluent granules. Dorsal and exterior surface densely covered with moderately large punctations; latter bearing broad granules. Inner surface densely covered with fine to medium sized granules. Three to four very large granules on dorso-proximal margin. Ventral surface densely punctate and bearing scattered, large broad granules. Trichobothrial pattern (fig. 2): $P_{1, 2, \text{and } 3}$ form isosceles triangle with $P_{1, \text{and } 2}$ equal to $P_{1, \text{and } 3}$; $P_{2, 6, \text{and } 10}$ in line but not P_{11} ; $P_{3, 8, \text{and } 12}$ in line; $P_{3, 7, \text{and } 13}$ almost in line; $P_{4, 9, \text{and } 13}$ and $P_{5, 7, \text{and } 8}$ not in line; $P_{6, 7, \text{and } 8}$, $P_{7, 8, \text{and } 9}$ and $P_{6, 7, \text{and } 9}$ form scalene triangles; $V_{1, 2, \text{and } 3}$ in line. *Femur* dorsal keels well developed and bearing very large granules. Ventro-inner keel well developed and bearing scattered, very large granules. Ventro-exterior keel lacking. Dorsal surface with coarse punctations throughout and densely covered with granules ranging from small to moderate size distad as well as very large granules scattered through proximal half. Inner surface densely covered with moderate to very large granules. Ventral surface densely granular with fine to tolerably large granules proximad; also many intergranular fine punctations. Exterior surface punctate and bearing scattered, broad granules.

Walking legs. Tibia and tarsomeres fairly hirsute; other joints lightly so. Femurs bearing fine to coarse granules with coarse granules on inferior and superior edges. Patella lightly granular except for moderate granulation laterally on IV. Patellas punctate. Tibia and tarsomere agranular and lightly punctate. Tarsomere spine formula: $\frac{3}{3} \frac{3}{3}, \frac{4}{4} \frac{4}{4}, \frac{5}{5} \frac{5}{5}, \frac{5}{5} \frac{5}{5}$.

OPISTHOSOMA: *Mesosoma*. *Tergites* I through VII densely and finely granular; tergite VII in addition bears lateral clusters of large granules and two pair of vestigial lateral keels with large granules. *Sternites* lightly hirsute; scattered coarse punctations. VII with vestiges of two pair of lateral keels bearing some large granules. *Genital operculum* anterior portion protruding considerably more than opposite side. *Pectines* with teeth 9/10; four small middle lamellae; moderately to densely hirsute; well developed subtriangular fulcra. Third marginal lamellae length 1.21 times that of second. Basal piece of pecten with straight posterior margin but bearing slight but broad median notch on anterior margin.

Metasoma. Intercarinal spaces generally agranular. Dorsal furrow moderately developed on segments I through IV but slightly so on V. Dorsal keels moderately developed on segments I through IV and bearing widely spaced large granules. Superior lateral keels poorly developed on all segments and bear somewhat smaller widely spaced granules. Median lateral keels vestigial on segment I with some large granules; very slight traces on II and absent on other segments. Inferior lateral and median keels moderately developed on I with several large, confluent granules; weakly developed and less granular on II; agranular and vestigial on III; vestigial but bearing some large granules on IV; weakly developed on V but bearing very large granules. Crescentic area well developed; approximately as long as wide with double row of large, rounded granules anteriorly and two such granules in lightly hirsute intercrescentic area. Anterior ridge of anal arch bears 11 granules plus two rounded terminal lateral granules. Posterior ridge agranular. Entire cauda sparsely hirsute with heaviest concentration on ventral surface of V. Telson lightly hirsute; clusters of two, three, and four granules near ventro-proximal margin. Subaculear tubercle distal edge forms about a 90° angle with telson surface.

TYPE. *Holotype*, male, length 60.25 mm., AS no. 1856.2, taken 26 March 1953 by J. P. Figg-Hoblyn on Isla Santa Cruz, Baja California del Sur, Mexico. Repository: California Academy of Sciences, Type no. 9553.

***Bioculus danzantiensis* Stahnke, new species.**

DIAGNOSIS. *B. belvederi* specimens taken on same day and same locality as holotype of this species. Females differ as follows:

| <i>B. belvederi</i> | <i>B. danzantiensis</i> |
|--|---|
| 1. Color: light brown | Dark chestnut brown |
| 2. Non-punctate | Pedipalps and cauda densely punctate |
| 3. Trichobothrial patterns: | |
| a) D ₄ proximal to D ₅ | D ₄ distad to D ₅ |
| b) M _{1, 2, and 4} , E _{1, 3, and 5} in line | Not in line |
| c) P _{1, 2, and 3} , P _{6, 7, and 9} form scalene triangles | Form isosceles triangles |
| d) V _{1, 2, and 3} not in line | In line |
| 4. Pedipalp femur dorso-exterior keel weak and agranular | Well developed and agranular |
| 5. Ratio of carapace <i>length</i> to greatest posterior <i>width</i> of carapace = 1.11 | = 1.03 |
| 6. Ratio of carapace <i>length</i> to caudal segment V length = 1.30 | = 1.15 |
| 7. Ratio of carapace <i>length</i> to <i>length</i> of pedipalp tarsus = 1.22 | = 1.04 |

8. Ratio of genital operculum *width*
to *length* = 2.43 = 1.93
9. Ratio of third marginal lamella
length to *length* of second mar-
ginal lamella = 1.33 = 0.80
10. Ratio of pecten basal piece *width*
to *length* = 1.34 = 1.69

DESCRIPTION. Trunk and cauda dark chestnut brown; manus of pedipalp chela, legs and manus of chelicera light brown. Entire animal with distinct, fuscous variegated pattern. Pedipalps and cauda densely punctate, other structures non-punctate.

PROSOMA: *Carapace*. Depth of anterior median notch (0.28 mm.) at level of posterior one-third of first pair of lateral eyes. Median ocular tubercle not prominent, agranular with dark, variegated pattern and flanked laterally by two elongated light spots. Entire carapace with variegated fuscous pattern and somewhat lighter areas on weakly developed frontal lobes; moderately contrasting variegated, fuscous band along anterior margin between lateral eyes; sparsely hirsute; densely covered with fine to small granules. Median ocular furrows lacking. Anterior median, lateral ocular and central median furrows broad but distinct. Posterior median and posterior marginal furrows deep but not distinctly slit-like. Latter distinctly *not* continuous with broad but well developed posterior lateral furrows. Carapace length 1.04 times that of pedipalp tarsus.

Sternum. Lateral sides converging posteriorly. Basal triangular pit with vertical sides and narrow apex that fans out abruptly at about one-third sternum length to form depressed, flat, diamond-shaped area.

Pedipalps. *Tarsus* densely hirsute; with small basal lobe. Distal fifth of inner surface bearing four large lateral granules in clusters of 2, 2. *Tibia* fixed finger densely hirsute. Trichobothrial pattern (fig. 1): $D_{1,2,\text{and }3}$ and $D_{4,5,\text{and }6}$ form isosceles triangles with $D_{1,\text{and }2}$ equal to $D_{2,\text{and }3}$ and $D_{4,\text{and }5}$ equal to $D_{4,\text{and }6}$; D_4 distad to D_5 ; distal edge of I_3 cup touching line between $I_{2,\text{and }4}$. Manus interior and exterior surface lightly hirsute. No costate reticulum. Indefinite punctate and fuscous reticulations. Agranular except for widely separated large, dark granules on distal half of interior marginal keel. Exterior marginal keel strongly developed and bearing some indistinct, confluent granules. Other keels vestigial and agranular but represented by irregular fuscous stripes interconnected laterally by indistinct reticulum. Exterior surface convexity spread uniformly through three central keels. Trichobothrial pattern (fig. 1): $M_{1,3,\text{and }5}$ in line, proximal edge of M_2 cup touching this line; distal edge of B_2 cup touching line between $B_{1,\text{and }3}$; $B_{3,4,\text{and }5}$ form isosceles triangle with $B_{3,\text{and }4}$ equal to $B_{4,\text{and }5}$; E_3 and E_4 on the same side of line between $E_{1,\text{and }5}$ with cup of E_3 touching that line. *Patella* dorso-inner keel well developed but agranular.

Dorso-exterior keel vestigial and agranular. Ventro-inner keel weakly developed and bearing broad, dark granules. Ventro-exterior keel weak and agranular. Dorsal and exterior surfaces agranular. Inner surface densely covered with fine to small granules and bearing cluster of three to four granules on dorso-proximal marginal prominence. Ventral surface agranular. Trichobothrial pattern (fig. 2): $P_{1,2,\text{and }3}$ form isosceles triangle with $P_{1,\text{and }2}$ equal to $P_{1,\text{and }3}$; $P_{2,6,\text{and }10}$, $P_{3,7,\text{and }13}$, $P_{3,8,\text{and }12}$ and $P_{5,7,\text{and }8}$ in line; $P_{4,9,\text{and }13}$ not in line; $P_{6,7,\text{and }8}$, $P_{7,8,\text{and }9}$ and $P_{6,7,\text{and }9}$ form isosceles triangles with $P_{6,\text{and }7}$, $P_{6,\text{and }8}$, and $P_{7,\text{and }9}$ equal; $V_{1,2,\text{and }3}$ in line. *Femur* dorso-inner keel well developed and bearing irregularly arranged, very large, broad granules. Dorso-exterior keel well developed and bearing some large, confluent granules. Ventro-inner keel moderately developed and bearing four or five widely spaced, very large, dark, broad granules. Ventro-exterior keel vestigial and essentially agranular. Dorsal surface, convex at proximal two-thirds, densely covered with broad, low granules. Inner surface densely covered with small to very large, coarse granules. Exterior surface essentially agranular.

Walking legs. Lightly to moderately hirsute. Agranular. Tarsomere spine formula: $\frac{3}{3} \frac{3}{3}, \frac{4}{4} \frac{4}{4}, \frac{5}{5} \frac{5}{5}, \frac{5}{5} \frac{5}{5}$.

OPISTHOSOMA: *Mesosoma.* All *tergites* sparsely hirsute and shiny; essentially agranular except for clusters of granules in area of lateral keel vestiges on segment VII. *Sternites* shiny and moderately hirsute. VII with agranular vestiges of lateral keels. *Genital operculum* posterior and anterior margin protrusions subequal. *Pectines* with teeth 8/8; three distinct, subcircular middle lamellae; moderately large, subtriangular fulcra. Third marginal lamella length 0.80 times that of second. Basal piece with straight posterior margin but anterior margin has broad and shallow median notch.

Metasoma. Dorsal furrow very shallow on I–IV; absent on V. Dorsal keels vestigial and agranular except for several granules on V. Superior lateral and median lateral keels essentially absent and agranular. Inferior laterals and median keels weakly developed and agranular on segments I and II; absent on III to V. Inferior laterals on V represented by some large granules; inferior median agranular. All keels represented by irregular fuscous stripes. Crescentic area depressed, broader than long but indefinitely delimited anteriorly by cluster of irregularly arranged granules and outlined laterally by narrow chisel-shaped granules which continue indefinitely to lateral areas of anal crest. Anterior crest of anal arch with seven granules; these essentially continuous with two similar granules on each lateral terminus. Posterior crest agranular except for single, large, cone-shaped granule on each lateral terminus. All segments moderately to densely hirsute. *Telson* ventral and lateral surfaces moderately hirsute; clusters of 3, 3, 3 large granules near ventro-proximal margin. Subaculear tubercle distal edge forms about a 90° angle with telson surface.

TYPE. *Holotype*, female, length 37.53 mm., Parrish no. 150A, taken 7 April 1962 by Members of Belvedere Expedition, Isla Danzante, Baja California del Sur, Mexico. Repository: California Academy of Sciences, Type no. 9554.

Bioculus figghoblyni Stahnke, new species.

DIAGNOSIS. See diagnosis of *B. parrishi*.

DESCRIPTION. Entire animal light brown; trunk with brown variegated pattern; appendages and cauda concolorous. All structures non-punctate.

PROSOMA: *Carapace*. Depth of anterior median notch (0.15 mm.) at a level of posterior one-third of first pair of lateral eyes. Median ocular tubercle not prominent, agranular with brown variegated pattern and flanked laterally by two elongated light spots. Entire carapace with variegated brown pattern, with essentially clear areas in region of moderately developed frontal lobes and variegated brown band along anterior margin between lateral eyes; very sparsely hirsute; agranular except for some very minute granules laterad. Median ocular furrow lacking. Anterior median furrow slight vestige, lateral ocular furrows and central median furrows broad and shallow. Posterior median and posterior marginal furrows broad, moderately deep; latter indistinctly continuous with broad and moderately deep posterior lateral furrows. Carapace length 1.18 times that of pedipalp tarsus. *Sternum*. Lateral sides slightly converging posteriorly. Basal triangular depression relatively shallow whose narrow apex widens abruptly into sub-diamond-shaped, undepressed, flat area covering anterior two-thirds of sternum. *Pedipalps*. *Tarsus* lightly hirsute; with small basal lobe; cutting edge red. Distal fifth of inner surface bearing five large, lateral granules in clusters of 2, 2, 1. Length of tarsus 1.34 times manus width. *Tibia* fixed finger lightly hirsute. Trichobothrial pattern (fig. 1): $D_{1,2,\text{and }3}$ form scalene triangle; $D_{4,5,\text{and }6}$ form isosceles triangle with $D_{4,\text{and }6}$ equal to $D_{5,\text{and }6}$; I_3 proximal to line between $I_{2,\text{and }4}$. Manus very lightly hirsute. No costate reticulum; non-punctate; concolorous and agranular except for a few inconspicuous, broad granules on distal one-third of weakly developed inner marginal keel. Other keels absent except vestigial exterior marginal keel. Exterior surface convexity not pronounced but located primarily in region of superior digital and superior lateral exterior keels. Trichobothrial pattern (fig. 1): $M_{1,3,\text{and }5}$ and $M_{1,2,\text{and }4}$ in line; B_2 proximal to line between $B_{1,\text{and }3}$; $B_{3,4,\text{and }5}$ form isosceles triangle with $B_{3,\text{and }4}$ equal to $B_{4,\text{and }5}$; $E_{1,4,\text{and }5}$ in line. *Patella*. All keels absent or vestigial and agranular. All surfaces agranular except inner surfaces which bear scattered small granules and two medium-sized, cone-shaped granules on dorso-proximal marginal prominence. Trichobothrial pattern (fig. 2): $P_{1,2,\text{and }3}$ form isosceles triangle with $P_{1,\text{and }2}$ equal to $P_{1,\text{and }3}$; $P_{2,6,10,\text{and }11}$, $P_{3,8,\text{and }12}$ in line; $P_{4,9,\text{and }13}$, $P_{5,7,\text{and }8}$ almost in line; $P_{3,7,\text{and }13}$ not in line; $P_{6,7,\text{and }8}$ form isosceles triangle with $P_{6,\text{and }7}$ equal to $P_{6,\text{and }8}$; $P_{7,8,\text{and }9}$ and $P_{6,7,\text{and }9}$ form

scalene triangles; $V_{1, 2, \text{ and } 3}$ not in line. *Femur* dorso-inner and ventro-inner keels moderately developed and bearing scattered, large granules. Other keels vestigial. All surfaces agranular except inner surface which bears scattered large and very small granules and dorsal surface which bears some broad granules and has proximal third somewhat convex.

Walking legs. Lightly hirsute, concolorous, agranular. Tarsomere spine formula: $\frac{4}{3} \frac{4}{3}, \frac{5}{5} \frac{5}{5}, \frac{6}{6} \frac{6}{6}, \frac{6}{6} \frac{6}{6}$.

OPISTHOSOMA: *Mesosoma.* *Tergites* very sparsely hirsute, agranular and essentially keelless. *Sternites* shiny and very sparsely hirsute; VII with agranular vestiges of lateral keels. *Genital operculum* anterior and posterior protrusions equal. *Pectines* with teeth 11/11; four small middle lamellae; moderately large subtriangular fulcra. Third lamella length 1.23 times that of second. Basal piece posterior margin straight but anterior margin has broad, median notch and sides converge posteriorly.

Metasoma. Dorsal furrow shallow on I-IV; absent on V. All keels vestigial and agranular except as noted. Some large, clear granules on dorsal keels. Inferior laterals and medians moderately developed but agranular on segment I; slightly developed and agranular on II; absent on III and IV; represented by several large granules on V. Crescentic area about as broad as long; outlined proximally by irregularly arranged granules and laterally by narrow, chisel-shaped granules; latter continuous with terminal granules of anal arch. Anterior crest of anal arch bears poorly formed granules; not continuous with two much larger denticulate, lateral terminal granules. Posterior crest agranular. All segments sparsely hirsute. *Telson* ventral and lateral areas lightly hirsute; clusters of 2, 2, 2 large granules near ventro-proximal margin. Subaculear tubercle distal edge forms about 80° angle with telson surface.

TYPE. *Holotype*, male, length 17.59 mm., AS no. 1860.3, taken 10 March 1953 by J. P. Figg-Hoblyn, Isla Cerralvo, Baja California del Sur, Mexico. Repository: California Academy of Sciences, Type no. 9555.

***Bioculus lindsayi* Stahnke, new species.**

DIAGNOSIS. Locality and sex of *B. prolatio*, holotype same as that of this species; coloration and punctation very similar. Significant differences as follows:

| <i>B. prolatio</i> | <i>B. lindsayi</i> |
|---|--------------------|
| 1. Lateral ocular and central median furrows deep | Both shallow |
| 2. Central transverse furrow present | Lacking |
| 3. Posterior lateral furrows well developed | Weakly so |

- | | |
|--|--------------------------------|
| 4. Inner surface of femur sparsely granular | Densely so |
| 5. Posterior edge of pecten basal piece protruding extensively | No unusual extension posteriad |
| 6. Trichobothrial patterns: | |
| a) $D_{1, 2, \text{ and } 3}$ form scalene triangle | Form isosceles triangle |
| b) $D_{4, 5, \text{ and } 6}$ form isosceles triangle | Form scalene triangle |
| c) $P_{2, 6, 10, \text{ and } 11}$ in line | Not in line |
| d) $P_{4, 9, \text{ and } 13}$ not in line | In line |
| e) $P_{6, 7, \text{ and } 8}$ form scalene triangle | Form isosceles triangle |
| f) $V_{1, 2, \text{ and } 3}$ not in line | In line |
| 7. Ratio of <i>distance</i> between first and second lateral eyes to <i>diameter</i> of first lateral eye = 0.60 | = 0.40 |
| 8. Ratio of <i>length</i> of leg IV coxa to <i>length</i> of pectinal dentate margin = 2.22 | = 2.45 |
| 9. Ratio of genital operculum <i>width</i> to <i>length</i> = 2.51 | = 2.26 |
| 10. Ratio of pecten basal piece <i>width</i> to <i>length</i> = 0.97 | = 1.45 |

DESCRIPTION. Entire animal medium brown with distinct, variegated pattern throughout. Chela of pedipalp moderately to densely punctate; patella lightly to moderately punctate; femur non-punctate. All other structures non-punctate.

PROSOMA: *Carapace*. Depth of anterior median notch (0.33 mm.) at level of anterior one-third of diameter of second pair of lateral eyes. Median ocular tubercle moderately prominent, agranular with blackish brown variegated pattern flanked by two elongated light areas. Entire surface with distinct dark brown variegated pattern, with lighter areas on moderately developed frontal lobes and variegated light, fuscous band along anterior margin between lateral eyes; sparsely hirsute; agranular except for some granules near lateral eye. Median ocular furrow lacking. Anterior median furrow vestigial. Lateral ocular furrow and central median furrow broad and shallow. Posterior median furrow narrow and slit-like. Posterior marginal furrow deep but not slit-like and indistinctly continuous with moderately to weakly developed posterior lateral furrows. Carapace length 1.01 times length of pedipalp tarsus. *Sternum* lateral sides converge posteriad. Basal triangular pit with vertical sides and narrow, almost slit-like, apex that extends anteriorly about one-third sternal length and

fans out into depressed, flat, diamond-shaped area covering anterior two-thirds. Sternum length 1.32 times the width.

Pedipalps. *Tarsus* densely hirsute; without basal lobe. Distal fifth of inner surface bearing six large, lateral granules in clusters of 2, 2, 2. *Tibia* fixed finger moderately hirsute. Trichobothrial pattern (fig. 1): $D_{1,2, \text{and } 3}$ form isosceles triangle with sides $D_{1, \text{and } 2}$ equal to $D_{1, \text{and } 3}$; $D_{4,5, \text{and } 6}$ form scalene triangle; D_4 distad to D_5 ; I_3 proximad to line between $I_{2, \text{and } 4}$. Manus interior distal one-third lightly to moderately hirsute; exterior surface lightly so. Both interior and exterior surfaces essentially agranular but bear numerous punctations not distinctly reticulate. Superior keels, both those absent and vestigial, represented by darker brown pigmented stripes between which extend reticulum of same color. Exterior marginal keel moderately developed and agranular. Interior marginal keel moderately developed with row of widely spaced, conical granules on its distal two-thirds. Superior exterior secondary, superior exterior and superior digital keels vestigial and agranular, last mentioned absent on fixed finger; superior inner secondary absent. Exterior surface strongly convex in region of superior exterior and superior digital keels. Trichobothrial pattern (fig. 1): $M_{2,3, \text{and } 4}$ distad to line between $M_{1, \text{and } 5}$; B_2 proximad to line between $B_{1, \text{and } 3}$; area within scalene triangle formed by $B_{3,4, \text{and } 5}$ agranular; $E_{3, \text{and } 4}$ on opposite side of line between $E_{1, \text{and } 5}$. *Patella* dorso-inner keel moderately developed but agranular. Dorso-exterior and ventro-exterior keels weakly developed and agranular. Ventro-inner keel weakly developed but bearing several low, broad granules. Dorsal surface agranular and bears some large punctations. Inner surface densely covered with very fine granules and four to five moderate to large, cone-shaped granules on dorso-proximal margin. Exterior and ventral surfaces agranular. Trichobothrial pattern (fig. 2): $P_{1,2, \text{and } 3}$ form scalene triangle; $P_{2,6, \text{and } 10}$ in line but not P_{11} ; $P_{3,8, \text{and } 12}$ in line; $P_{4,9, \text{and } 13}$ and $P_{5,7, \text{and } 8}$ in line; $P_{6,7, \text{and } 8}$ form isosceles triangle with $P_{6, \text{and } 8}$ equal to $P_{7, \text{and } 8}$; $P_{7,8, \text{and } 9}$ form isosceles triangle with $P_{7, \text{and } 8}$ equal to $P_{7, \text{and } 9}$; $P_{6,7, \text{and } 9}$ form scalene triangle; $V_{1,2, \text{and } 3}$ in line. *Femur* dorso-inner and ventro-inner keels moderately developed and bearing large granules. Dorso-exterior keel vestigial and agranular; ventro-exterior keel lacking. Dorsal surface moderately covered with small to large granules; the largest granules concentrated mainly in proximal one-half; very few punctations. Inner surface densely covered with small to very large granules. Exterior and ventral surfaces agranular; latter surface with several granules on anterior margin.

Walking legs. *Tibia* and tarsomere moderately hirsute; other joints lightly so. Not punctate. Agranular except for some granules on inferior edge of femurs. Tarsomere II spine formula: $\frac{3}{3}, \frac{3}{3}, \frac{4}{4}, \frac{5}{5}, \frac{5}{5}, \frac{5}{5}$.

OPISTHOSOMA: *Mesosoma*. *Tergites* I through VI shiny, smooth and sparsely hirsute; VII agranular except for some moderate sized granules on two pair of

lateral keels. *Sternites* lightly hirsute on lateral margins of III–VI; surface of VII moderately hirsute. Non-punctate. VII with granular vestiges of two pair of lateral keels. *Genital operculum* anterior margin subequal to opposite margin. *Pectines* with teeth 8:8; three small middle lamellae; moderately hirsute; and small to medium sized subtriangular fulcra. Third marginal lamella length 1.27 times that of second. Basal piece of pecten with approximately straight posterior margin but bearing broad median notch on anterior margin.

Metasoma. Dorsal furrow moderately developed on segments I through IV but slightly so on V. Dorsal keels moderately developed and with some low, broad granules on segments I through IV. Superior lateral keels vestigial on segments I through IV and bearing widely spaced granules. Median lateral keels vestigial on segment I but bearing several, broad granules and represented by fuscous pigment on other segments. Inferior lateral keels well developed on segments I and II, weakly on III and bearing indefinite confluent granules on all three; vestigial on IV and weakly developed but bearing large, cone-shaped granules on V. Median keels similarly developed but absent on IV and very weakly developed on V with large, irregularly arranged, somewhat cone-shaped granules. Crescentic area well developed, about as broad as long, with anterior margin poorly defined by irregularly formed cluster of large granules. Anterior crest of anal arch with about seven granules plus one large, denticulate granule laterally at each end. Posterior crest agranular except for several, large cone-shaped granules on each lateral extremity. All caudal segments ventrally moderately to densely hirsute. *Telson* ventrally densely hirsute; clusters of 3, 2, 3 large granules near ventro-proximal margin. Subaculear tubercle distal edge forms about a 90° angle with telson surface.

TYPE. *Holotype*, female, length 38.23 mm., Parrish no. 195, taken 18 April 1962, by George Lindsay on southwest side of Isla Santa Cruz, Baja California del Sur, Mexico. Repository: California Academy of Sciences, Type no. 9556.

Bioculus luteus Stahnke, new species.

DIAGNOSIS. Only one specimen taken from this small island. Its yellowish tawny color and almost complete absence of infusate pattern set it off quite distinctly from other members of genus. Crescentic area poorly defined; clearly delimited on other species of genus. Lateral terminal granules of anal arch continuous with those of inferior lateral keels.

DESCRIPTION. Entire animal concolorous, yellowish tawny except for indistinct variegated fuscous pattern on carapace and reddish tinge on pedipalp chela. Pedipalps densely and conspicuously punctate; cauda and carapace very lightly and inconspicuously punctate; other structures non-punctate.

PROSOMA: *Carapace*. Depth of anterior median notch (0.37 mm.) at level slightly posterior to posterior margin of first pair of lateral eyes. Median ocular

tubercle rather prominent, agranular, with dark brown variegated pattern and flanked laterally by two elongate light spots. Entire carapace with light brown, indistinct variegated pattern but with essentially clear areas on moderately developed frontal lobes and indistinct, variegated fuscous band along anterior margin between lateral eyes; sparsely hirsute; agranular except for indistinct fine granules laterad. Median ocular furrow lacking. Anterior median furrow broad but distinct. Well developed lateral ocular furrows. Central median furrow broad but distinct. Posterior median and posterior marginal furrows deep and almost slit-like. Latter distinctly *not* continuous with broad, well developed postero-lateral furrows. Carapace length 1.08 times that of pedipalp tarsus. *Sternum*. Lateral sides essentially parallel. Moderately deep triangular depression whose apex broadens quickly into depressed, flat diamond-shaped area covering about two-thirds anterior area.

Pedipalps. *Tarsus* densely hirsute; with slight trace of basal lobe. Distal fifth of inner surface bearing five large, lateral granules in clusters of 2, 2, 1. *Tibia* fixed finger moderately hirsute. Trichobothrial pattern (fig. 1): $D_{1,2,\text{and }3}$ and $D_{4,5,\text{and }6}$ form scalene triangles; D_4 distinctly distad to D_5 ; I_3 distinctly proximad to line between $I_{2,\text{and }4}$. Manus interior and exterior lightly hirsute. No costate reticulum. Punctations show no distinct reticulation. Agranular except for row of widely spaced, very large, red granules on interior marginal keel. Exterior marginal keel strongly developed, and bearing large, reddish confluent granules. Other keels vestigial and agranular. Exterior surface most convex in region of superior exterior and superior digital keels. Trichobothrial pattern (fig. 1): Proximal edge of M_3 cup touching line with $M_{1,\text{and }5}$; $M_{2,\text{and }4}$ distinctly distal to this line; $D_{4,\text{and }5}$ and M_1 form isosceles triangle with D_4 and M_1 equal to D_5 and M_1 ; distal cup of B_2 touching line between $B_{1,\text{and }3}$; $B_{3,4,\text{and }5}$ form scalene triangle; $E_{1,3,\text{and }5}$ in line. *Patella* dorso-inner keel well developed and bearing confluent granules. Dorso-exterior keel absent and agranular. Ventro-inner keel weakly developed and bearing row of about five or six moderately large granules. Ventro-exterior keel weak and agranular. Inner surface densely covered with fine granules and bearing three or four large granules on dorso-proximal margin. Dorsal, ventral and exterior surfaces agranular. Trichobothrial pattern (fig. 2): $P_{1,2,\text{and }3}$ form isosceles triangle with $P_{1,\text{and }2}$ equal to $P_{1,\text{and }3}$; $P_{2,6,10,\text{and }11}$ almost in line; $P_{3,8,\text{and }12}$ in line; $P_{4,9,\text{and }13}$ not in line; $P_{5,7,\text{and }8}$ almost in line; $P_{6,7,\text{and }8}$ form isosceles triangle with $P_{6,\text{and }8}$ equal to $P_{7,\text{and }8}$; $P_{7,8,\text{and }9}$ and $P_{6,7,\text{and }9}$ form scalene triangles; $V_{1,2,\text{and }3}$ not in line. *Femur* dorso-inner and ventro-inner keels weakly developed but irregularly covered by large, coarse granules. Dorso-exterior keel moderately developed and bearing small to coarse granules. Ventro-exterior keel vestigial and bearing some small granules. Dorsal surface with scattered moderately large granules. Inner surface densely covered with small to large granules. Exterior and ventral surfaces with some scattered granules.

Walking legs. Lightly to moderately hirsute with greatest concentration on tibia and tarsomeres. Agranular except for moderately large granules on ventral edge of femurs. Tarsomere spine formula: $\frac{3}{3}, \frac{3}{3}, \frac{4}{4}, \frac{4}{4}, \frac{5}{5}, \frac{5}{5}, \frac{5}{5}, \frac{5}{5}$.

OPISTHOSOMA: *Mesosoma.* *Tergites* sparsely hirsute; I–VI concolorous, shiny and essentially agranular; VII with vestiges of lateral keels and small lateral clusters of granules. *Sternites* shiny, lightly hirsute. VII with slight, agranular vestiges of lateral keels; somewhat more hirsute than other sternites. *Genital operculum* anterior margin protrudes more than posterior margin. *Pectines* with teeth 8/8; two distinct, subcircular middle lamellae and third incomplete; moderately large subtriangular fulcra. Third marginal lamella length 0.76 times that of second. Basal piece with straight posterior margin but anterior margin has distinct, broad median notch.

Mctasoma. Dorsal furrow weakly developed on segments I to IV; absent on V. Dorsal, superior lateral and median lateral keels essentially absent and agranular. Inferior laterals and inferior medians weakly developed and agranular on segment I; absent and agranular on II–IV; absent on V but with four to six large granules on distal portion of laterals and one or two granules on median. Crescentic area indistinctly delimited; lateral granules continuous with those of inferior lateral keel granules; anterior margin with subcircular cluster of about eight large, broad granules. Anterior crest of anal arch with about 12 granules; discontinuous with large, lateral terminal granules. Posterior crest agranular except for one or two large, cone-shaped granules on each lateral terminus. All segments lightly to moderately hirsute. *Telson* ventral and lateral areas densely hirsute. A row of eight, unclustered, large, reddish granules near ventro-proximal margin. Subaculear tubercle distal edge forms about a 90° angle with telson surface.

TYPE. *Holotype*, female, length 43.53 mm., Parrish no. 188, taken 17 April 1962 by Chris Parrish, southeast side of Isla San Francisco, Baja California del Sur, Mexico. Repository: California Academy of Sciences, Type no. 9557.

***Bioculus parraensis* Stahnke, new species.**

DIAGNOSIS. See diagnosis for *B. comondae*.

DESCRIPTION. Entire animal light brown with a variegated fuscous pattern; fuscous pattern on appendages very indistinct in general and absent on chela of pedipalps; chelicera more yellowish; pedipalp fingers with reddish tinge. Pedipalps punctate; other parts of animal essentially non-punctate.

PROSOMA: *Carapace.* Depth of anterior median notch (0.22 mm.) at level of posterior one-fourth of diameter of first pair of lateral eyes. Median ocular tubercle fairly prominent, agranular with variegated pattern and flanked laterally by two elongated light spots. Entire carapace with light brown, variegated pattern but essentially clear areas on rather well developed frontal lobes and

variegated fuscous band along anterior margin between lateral eyes. Surface agranular and smooth. Anterior margin moderately hirsute. Anterior median and median ocular furrows vestigial. Broad, shallow lateral ocular furrows. Central median furrow shallow to begin with but gets increasingly deeper posteriorly and joins the deep slit-like posterior median furrow. Posterior marginal furrow deep, narrow but not slit-like and distinctly *not* continuous with the fairly well developed posterior lateral furrows. Carapace length 1.11 times that of pedipalp tarsus. *Sternum*. Lateral sides converging slightly posteriad. Basal triangular pit without vertical sides, relatively narrow apex extending about one-third sternum length and fanning out into flat, but not depressed, somewhat diamond-shaped area. Sternum length 1.24 times the width.

Pedipalps. *Tarsus* densely hirsute; without basal lobe. Distal fifth of inner surface bearing five large, lateral granules in clusters of 2, 1, 1, 1; the ultimate being about three times as large as penultimate. *Tibia* fixed finger densely hirsute. Trichobothrial pattern (fig. 1): $D_{1,2, \text{ and } 3}$ form isosceles triangle with $D_{1, \text{ and } 3}$ and $D_{2, \text{ and } 3}$ equal; $D_{4,5, \text{ and } 6}$ form equilateral triangle; D_4 slightly proximad to D_5 ; I_3 distinctly proximad to line between $I_{2, \text{ and } 4}$. Manus interior distal two-thirds lightly to moderately hirsute; exterior surface very lightly so. Both interior and exterior surfaces agranular except as noted later and distinctly punctate. Exterior marginal keel moderately developed and bearing broad, confluent granules. Interior marginal keel weakly developed and bearing widely separated large granules on distal two-thirds. All other keels absent and not represented by pigmented stripes. Exterior surface strongly convex in region of superior exterior and superior digital keels. Trichobothrial pattern (fig. 1): Cup of M_3 touching line between $M_{1, \text{ and } 5}$; $M_{2, \text{ and } 4}$ distal to this line; $M_{1,2, \text{ and } 4}$ in line; $M_{1,4, \text{ and } 5}$ do not form isosceles triangle; $B_{1,2, \text{ and } 3}$ in line; B_3 proximad to line between $B_{2, \text{ and } 5}$; $B_{3,4, \text{ and } 5}$ form scalene triangle; $E_{3, \text{ and } 4}$ on same side of line between $E_{1, \text{ and } 5}$. *Patella* dorso-inner keel well developed but agranular. Ventro-inner keel moderately developed and bearing large, broad granules. Other keels vestigial and agranular. Dorsal surface lightly punctate and agranular. Inner surface rather densely covered with fine granules, and bearing three very large granules on dorso-proximad margin. Ventral surface lightly punctate and with sparse covering of small granules. Exterior surface agranular. Trichobothrial pattern (fig. 2): $P_{1,2, \text{ and } 3}$ form scalene triangle; $P_{2,6, \text{ and } 10}$ in line but not P_{11} ; $P_{3,8, \text{ and } 12}$ and $P_{3,7, \text{ and } 13}$ almost in line; $P_{4,9, \text{ and } 13}$ in line; $P_{5,7, \text{ and } 8}$ not in line; $P_{6,7, \text{ and } 8}$ form equilateral triangle; $P_{7,8, \text{ and } 9}$ and $P_{6,7, \text{ and } 9}$ form scalene triangles. *Femur* dorso-inner and ventro-inner keels moderately developed and bearing large, dark granules irregularly arranged. Dorso-exterior keel weakly developed but bearing broad, confluent granules. Ventro-exterior keel vestigial and agranular. Dorsal surface covered with only few scattered granules. Inner surface densely covered with small to large granules. Exterior and ventral surfaces agranular.

Walking legs: Lightly to moderately hirsute with greatest concentration on patella, tibia and tarsomeres. Agranular. Tarsomere II spine formula:

$$\frac{3}{3} \frac{3}{3}, \frac{4}{4} \frac{4}{4}, \frac{5}{5} \frac{5}{5}, \frac{5}{5} \frac{5}{5}.$$

OPISTHOSOMA: *Mesosoma.* *Tergites* I through VI agranular, shiny, lightly hirsute on lateral and posterior margins. Tergite VII with small cluster of broad granules on two pair of vestigial lateral keels. *Sternites* III–VI moderately hirsute on lateral and posterior margin; VII moderately to densely hirsute and with vestiges of two pair of lateral keels along posterior margin. *Genital operculum* anterior and posterior margins about same shape. *Pectines* with teeth 8/8; four small middle lamellae, almost three of these opposite second marginal lamella; moderately hirsute; well developed subtriangular fulcra. Third marginal lamella length 1.42 times that of second. Basal piece posterior margin protruding somewhat lobe-like; anterior margin with relatively deep median notch.

Metasoma. Dorsal furrow weakly to moderately developed on I–IV but slight vestige on V. Dorsal keels poorly developed and agranular. Superior keels vestigial and agranular. Median lateral keels absent. Inferior lateral keels moderately developed and bearing broad, confluent granules on I and II; absent and agranular on III and IV; slight traces with irregular cluster of granules on V. Inferior median keels weak with broad, confluent granules on I; slight traces with several granules on II and V; absent on III and IV. Crescentic area slightly depressed, not distinctly crescentic in shape, broader than long, and outlined by widely separated, large granules irregularly arranged and few in number on anterior margin. Anterior crest of anal arch with about nine large granules plus two similar additional granules on each lateral terminus. Posterior crest agranular. All caudal segments moderately to densely hirsute ventrally. *Telson* moderately to densely hirsute; clusters of 4, 2, 4 large granules near ventro-proximal margin. Subaculear tubercle distal edge forms about 110° angle with telson surface.

TYPE. *Holotype*, female, length 33.72 mm., Parrish no. 24, taken 22 May 1961 by George Lindsay at top of grade above Parras Ranch, Parras Canyon, Baja California del Sur, Mexico. Elevation 1870 feet. Repository: California Academy of Sciences, Type no. 9558.

Bioculus parrishi Stahnke, new species.

DIAGNOSIS. Holotype of *B. figghoblyni* (male) taken 11 years earlier on same island as these specimens. It differs from this holotype (male) as follows:

B. figghoblyni

1. All structures non-punctate
2. Color: light brown

B. parrishi

- Pedipalps moderately punctate
- Yellowish tan

- | | |
|---|--|
| 3. All keels absent or vestigial and agranular on pedipalp patella | Dorso-inner and ventro-inner keels moderately developed with some broad granules on latter |
| 4. Pectines with four small middle lamellae | With one distinct and two indefinite |
| 5. Trichobothrial patterns: | |
| a) $D_{1, 2, \text{ and } 3}$ form scalene triangle | Form isosceles triangle |
| b) $D_{4, 5, \text{ and } 6}$ form isosceles triangle | Form scalene triangle |
| c) $M_{1, 3, \text{ and } 5}$ and $M_{1, 2, \text{ and } 4}$ in line | Not in line |
| d) $B_{3, 4, \text{ and } 5}$ form scalene triangle | Form isosceles triangle |
| e) $P_{2, 6, 10, \text{ and } 11}$ and $P_{3, 8, \text{ and } 12}$ not in line | In line |
| f) $P_{6, 7, \text{ and } 8}$ form scalene triangle | Form isosceles triangle |
| 6. Ratio of <i>distance</i> from line tangent to anterior margin to anterior edge of median eyes to <i>depth</i> of anterior median notch = 5.8 | = 7.8 |
| 7. Ratio of <i>distance</i> between first and second lateral eyes to <i>diameter</i> of first lateral eye = 0.29 | = 0.50 |
| 8. Ratio of carapace <i>length</i> to caudal segment V <i>length</i> = 1.33 | = 1.19 |
| 9. Ratio of <i>distance</i> from line tangent to posterior margin to posterior edge of median eyes to <i>distance</i> from line tangent to anterior margin to anterior edge of median eyes = 1.76 | = 1.57 |
| 10. Ratio of pecten basal piece <i>width</i> to <i>length</i> = 1.35 | = 1.60 |
| 11. Ratio of carapace <i>length</i> to <i>length</i> of caudal segment I plus II = 1.13 | = 1.01 |

DESCRIPTION. Entire animal a yellowish tan with light brown, variegated pattern throughout trunk dorsum; appendages and cauda concolorous. All structures non-punctate except moderately but inconspicuously punctate exterior of pedipalp manus.

PROSOMA: *Carapace*. Depth of anterior median notch (female, 0.22 mm.): (male, 0.18 mm.) to level of anterior (female) one-third, (male) one-half of

anterior pair of lateral eyes. Median ocular tubercle not prominent, agranular with brown variegated pattern and flanked laterally by two elongated light areas. Entire carapace with light brown variegated pattern, but essentially clear areas on moderately developed frontal lobes and variegated brown band along anterior margin between lateral eyes; sparsely hirsute; agranular except for scattered, very small granules laterad. Median ocular furrows lacking. Anterior median furrow slight vestige, lateral ocular and central median furrows broad and shallow. Posterior median and posterior marginal furrows deep, narrow but not slit-like; latter *not* continuous with broad, relatively shallow posterior lateral furrows. Carapace length 1.08 (female) and 1.10 (male) times that of pedipalp tarsus. *Sternum*. Lateral sides subparallel. Basal triangular pit with steep sides and narrow, but not slit-like, apex that abruptly broadens into slightly depressed, flat, diamond-shaped area.

Pedipalps. *Tarsus* moderately hirsute; with small basal lobe, larger on male; cutting and inferior edges red. Distal fifth of inner surface bearing six large, lateral granules in clusters of 2, 2, 2. *Tibia* fixed finger lightly to moderately hirsute. Trichobothrial pattern (fig. 1): $D_{1,2,\text{and }3}$ form on (female) equilateral triangle, (male) isosceles triangle with $D_{1,\text{and }2}$ equal to $D_{1,\text{and }3}$; $D_{4,5,\text{and }6}$ form scalene triangle; I_3 proximal to line between $I_{2,\text{and }4}$. Manus interior and exterior lightly hirsute but laterally moderately so. No costate reticulum; slightly punctate; concolorous and agranular except for scattered, broad granules; moderately developed interior marginal keel. Keels absent except vestigial exterior marginal keel. Exterior surface convexity not pronounced but located primarily in region of superior digital and superior exterior keels. Trichobothrial pattern (fig. 1): (Female) $M_{2,3,\text{and }4}$ definitely distal to line between $M_{1,\text{and }5}$, (male) cup of M_3 touches line between $M_{1,\text{and }5}$; (female) $M_{1,3,\text{and }4}$ in line, (male) not so. Distal edge of B_2 cup touching line between $B_{1,\text{and }3}$; $B_{3,4,\text{and }5}$ form scalene triangle but (female) $B_{4,\text{and }5}$ and E_5 form isosceles triangle, not so in male; $E_{3,\text{and }4}$ (female) on opposite sides of line between $E_{1,\text{and }5}$; $E_{1,3,\text{and }5}$ (male) in line. *Patella* dorso-inner and ventro-inner keels moderately developed and agranular except for some, broad granules on latter. Other keels absent and agranular. Surfaces agranular except for scattered, fine granules and one or two large granules on dorso-proximal margin of inner surface. Trichobothrial pattern (fig. 2): $P_{1,2,\text{and }3}$ form isosceles triangle with $P_{1,\text{and }2}$ equal to $P_{1,\text{and }3}$; $P_{2,6,10,\text{and }11}$ and $P_{3,8,\text{and }12}$ not in line; $P_{5,7,\text{and }8}$ and $P_{4,9,\text{and }13}$ in line; $P_{6,7,\text{and }8}$ form scalene triangle; $P_{7,8,\text{and }9}$ form isosceles triangle with $P_{7,\text{and }8}$ equal to $P_{7,\text{and }9}$; $V_{1,2,\text{and }3}$ not in line. *Femur* keels weak and vestigial; dorso-inner and ventro-inner with five or six large, non-pigmented, broad granules; other keels agranular. Surfaces agranular except for some scattered granules on dorsal and inner surfaces.

Walking legs. Lightly hirsute, concolorous and agranular. Tarsomere spine formula: $\frac{4}{4} \frac{4}{4} \frac{5}{5} \frac{5}{5} \frac{6}{6} \frac{6}{6} \frac{6}{6} \frac{6}{6}$.

OPISTHOSOMA: *Mesosoma*. All *tergites* very sparsely hirsute, agranular except for small cluster on postero-lateral area of VII; vestiges of lateral keels on VII. *Sternites* shiny and moderately hirsute. VII with agranular vestiges of lateral keels. *Genital operculum* anterior and posterior protrusions equal; width 2.32 (female) and 2.40 (male) times length. *Pectines* with teeth 9/9 (female), 11/11 (male); one distinct and two indefinite small middle lamellae; relatively large subtriangular fulcra. Third marginal lamella length 1.39 (female) and 1.35 (male) times that of second. Basal piece posterior margin straight but anterior margin has broad, median notch.

Metasoma. Dorsal furrow shallow on I–IV, absent on V. All keels vestigial and agranular except as noted. Few large, clear granules on dorsal keels. Inferior lateral and median keels moderately developed but agranular on segment I; absent on III–V; on V laterals with row of large, clear, cone-shaped granules; median with few such granules. Crescentic area longer than broad; outlined by relatively wide spaced, chisel-shaped, clear granules in line with lateral granules of anal arch. Anterior anal crest with about nine granules not in line with the two more denticulate lateral terminal granules. Posterior crest agranular except for one large granule on each lateral terminus. All segments ventrally moderately to densely hirsute. *Telson* ventral and lateral areas densely hirsute; clusters of 3, 3, 3 large granules near ventro-proximal margin. Subaculear tubercle distal edge forms about 85° angle with telson surface.

TYPES. *Holotype*, male, length 28.07 mm., Parrish no. 184, taken 16 April 1962 by Chris Parrish in Rancho Rufo, Isla Cerralvo, Baja California del Sur, Mexico. *Allotype*, female, length 31.37 mm., Parrish no. 174, taken 15 April 1962, by George Lindsay in Arroyo Aguaje, Isla Cerralvo, Baja California del Sur, Mexico. Repository: California Academy of Sciences.

Bioculus prolatio Stahnke, new species.

DIAGNOSIS. See diagnosis for *B. lindsayi*.

DESCRIPTION. Entire animal medium brown with infusate variegated pattern throughout. Pedipalp chela lightly punctate; patella and femur essentially non-punctate; all other structures definitely non-punctate.

PROSOMA: *Carapace*. Depth of anterior median notch (0.22 mm.) at level of about anterior two-thirds of diameter of first pair of lateral eyes. Median ocular tubercle not prominent, agranular with blackish brown variegated pattern flanked by two elongated light areas. Entire carapace with distinct dark brown variegated pattern, with lighter areas on somewhat depressed frontal lobes and variegated light fuscous band along anterior margin between lateral eyes. Median ocular furrows absent. Anterior median furrow vestigial. Lateral ocular and central median furrows broad but deep. Central transverse furrow moderately

well developed.² Posterior median furrow markedly slit-like. Posterior marginal furrow deep but not slit-like and not continuous with well developed and deep posterior lateral furrows. Carapace length 1.05 times that of pedipalp tarsus. *Sternum*. Lateral sides converging posteriad. Basal triangular pit without vertical sides, apex narrow, not slit-like, extends anteriorly about one-fourth the sternal length and expands into diamond-shaped depressed, flat area.

Pedipalps. *Tarsus* moderately hirsute; without basal lobe. Distal fifth of inner surface bearing four large, lateral granules in clusters of 2 and 2 followed posteriorly by a row of three granules. *Tibia* fixed finger lightly hirsute. Trichobothrial pattern (fig. 1): $D_{1,2,\text{and }3}$ form scalene triangle; $D_{4,5,\text{and }6}$ form isosceles triangle with $D_{4,\text{and }5}$ equal to $D_{4,\text{and }6}$; D_4 distad to D_5 ; I_3 proximad to line between $I_{2,\text{and }4}$. Manus interior distal one-third lightly hirsute; exterior surface sparsely so. Both interior and exterior surfaces agranular but moderately punctate. Exterior marginal keel moderately developed, and agranular. Interior marginal weakly developed and lightly granular. All other keels absent but represented by brown pigmented stripes between which extend incomplete pigment reticulations. Exterior surface strongly convex; highest point in region of superior digital keel. Trichobothrial pattern (fig. 1): $M_1, D_4,\text{and }5$ form isosceles triangle with D_4 and M_1 equal to D_5 and M_1 ; M_3 proximad to line between $M_{1,\text{and }5}$, $M_{3,\text{and }4}$ distal to this line, $M_{1,2,\text{and }4}$ in line; B_2 proximad to line between $B_{1,\text{and }3}$; B_3 proximad to line between $B_{2,\text{and }5}$; $B_{3,4,\text{and }5}$ form isosceles triangle with $B_{3,\text{and }4}$ equal to $B_{4,\text{and }5}$; $E_{3,\text{and }4}$ on opposite sides of line between $E_{1,\text{and }5}$. *Patella* dorso-inner keel moderately developed but agranular. Dorso-exterior and ventro-exterior keels weakly developed and agranular. Ventro-inner keel weakly developed and agranular. Dorsal surface agranular and lightly punctate. Inner surface moderately covered with small granules and four to five large, cone-shaped granules on dorso-proximal margin. Exterior and ventral surfaces agranular. Trichobothrial pattern (fig. 2): $P_{1,2,\text{and }3}$ form scalene triangle; $P_{2,6,10,\text{and }11}$ in line; $P_{3,8,\text{and }12}$ in line; $P_{3,7,\text{and }13}$ and $P_{4,9,\text{and }13}$ not in line; $P_{5,7,\text{and }8}$ almost in line; $P_{6,7,\text{and }8}$ form scalene triangle; $P_{7,8,\text{and }9}$ form isosceles triangle with $P_{7,\text{and }8}$ equal to $P_{8,\text{and }9}$; $V_{1,2,\text{and }3}$ not in line. *Femur* dorso-inner and ventro-inner keels moderately developed and bearing scattered large granules. Dorso-exterior keel vestigial and agranular; ventro-exterior keel lacking. Dorsal surface agranular except for proximal cluster of moderately large granules; non-punctate. Inner surface sparsely covered with small granules. Exterior and ventral surfaces agranular.

Walking legs. All segments lightly hirsute. Not punctate. Agranular. Tarsomere II spine formula: $\frac{3}{3} \frac{3}{3}, \frac{4}{4} \frac{4}{4}, \frac{5}{5} \frac{5}{5}, \frac{5}{5} \frac{5}{5}$

OPISTHOSOMA: *Mesosoma*. *Tergites* I through VI non-hirsute and agranular; VII agranular, except for some lateral small granules; slight vestiges of two

² There is a remote possibility that this is an artifact; its existence should be noted.

pair of lateral keels; lightly hirsute. *Sternites* III to VI non-hirsute and non-punctate. VII with agranular vestiges of two pair of lateral keels each of which bifurcate posteriorly. *Genital operculum* anterior margin protrusion subequal to opposite margin; width 2.51 length. *Pectines* with teeth 8/9; three small middle lamellae, two of which opposite second marginal lamella; moderately hirsute; medium sized, subtriangular fulcra. Third marginal lamella length 1.35 times that of second. Basal piece of pecten with posterior edge protruding extensively in lobate form; anterior margin with relatively deep and narrow median notch. Basal piece width 0.97 times length.

Mctasoma. Dorsal furrow shallow on segment I and becomes progressively more so posteriorly through IV and absent on V. Dorsal keels weakly developed and with one or two low, broad granules on segments I through IV. Superior lateral and median lateral keels vestigial on all segments and represented only by fuscous pigment except for some inconspicuous granules on I. Inferior lateral and median keels well developed on segments I and II, moderately so on III; former vestigial and latter absent on IV; weakly to moderately developed on V. Both inferior lateral and median keels bear large confluent granules on I and II; agranular on III and IV; on V inferior laterals with row of large granules but only several on inferior median keels. Crescentic area well developed, considerably broader than long with anterior margin poorly defined by irregularly arranged large granules. Anterior crest of anal arch with about 13 granules plus one double cusped larger, chisel-shaped granule laterally at each end. Posterior crest entirely agranular. All segments lightly hirsute. *Telson* ventrally moderately hirsute; clusters of 3, 2, 3 large granules near ventro-proximal margin. Subaculear tubercle distal edge forms about 90° angle with telson surface.

TYPE. *Holotype*, female, length 31.21 mm., AS no. 1856.3, taken 26 March 1953, by J. P. Figg-Hoblyn on Isla Santa Cruz, Baja California del Sur, Mexico. Repository: California Academy of Sciences, Type no. 9560.

***Bioculus santoensis* Stahnke, new species.**

DIAGNOSIS. Allotype of *B. belvederi* (male) differs from holotype of this species as follows:

| <i>B. belvederi</i> | <i>B. santoensis</i> |
|--|----------------------|
| 1. Anterior median furrow distinct | Vestigial |
| 2. Superior exterior keel vestigial | Strongly developed |
| 3. Exterior marginal keel strongly developed | Weakly developed |
| 4. Trichobothrial patterns: | |
| a) $M_{1,3, \text{ and } 4}$ in line | Not in line |
| b) $B_{1,2, \text{ and } 3}$ in line | Not in line |

- | | |
|--|---|
| c) $P_{6, 7, \text{ and } 8}$ form isosceles triangle | Form scalene triangle |
| 5. Pecten: | |
| a) Three middle lamellae | Four middle lamellae |
| b) Ten teeth | Eleven teeth |
| 6. Crescentic area delimited by uniformly placed granules | Delimited by widely and irregularly placed granules |
| 7. Ratio of <i>distance</i> between first and second lateral eyes to <i>diameter</i> of first lateral eye = 0.28 | = 0.83 |
| 8. Ratio of pecten basal piece <i>width</i> to <i>length</i> = 1.34 | = 1.64 |
| 9. Ratio of <i>length</i> of pecten terminal tooth to <i>length</i> of third marginal lamella = 0.73 | = 1.00 |
| 10. Ratio of ampulla <i>width</i> to <i>depth</i> = 1.23 | = 1.14 |

DESCRIPTION. Entire animal light tawny, non-punctate and with distinct, variegated, light brown pattern.

PROSOMA: *Carapace*. Depth of median notch (0.17 mm.) at level of posterior half of first pair of lateral eyes. Median ocular tubercle moderately prominent, agranular with brown variegated pattern and flanked laterally by two elongated light spots. Entire carapace with light brown, variegated pattern but essentially clear areas on moderately developed frontal lobes and a variegated, light brown band along anterior margin between lateral eyes; very sparsely hirsute; shiny and agranular. Median ocular furrow lacking. Anterior median furrow vestigial. Lateral ocular and central median furrows broad and shallow. Posterior median and marginal furrows broad and deep. Latter distinctly not continuous with well formed posterior lateral furrows. Carapace length 1.10 times that of pedipalp tarsus. *Sternum*. Lateral sides converging posteriorly; basal depression subtriangular with apex broad, not slit-like, and spreading anteriorly to broad shallow, somewhat diamond-shaped depression. Length 1.29 times width.

Pedipalps. *Tarsus* moderately hirsute with trace of basal lobe; edge not scalloped. Distal one-fifth of inner surface bearing seven large, lateral granules in clusters of 2, 2, 3. *Tibia* trichobothrial pattern (fig. 1): D_4 at same anterior-posterior level as D_5 ; $D_{2, 4, \text{ and } 5}$ form right angle; $D_{1, 2, \text{ and } 3}$ form equilateral triangle; $D_{4, 5, \text{ and } 6}$ form isosceles triangle; I_3 slightly proximal to line between $I_{2, \text{ and } 4}$. Manus distal portion lightly hirsute; exterior surface agranular. Superior exterior keel agranular but developed strongly so as to divide this surface into two areas. Superior digital keel vestigial. Interior marginal keel weakly

developed but bearing some broad granules. Exterior marginal keel weakly developed and agranular. Other keels absent and agranular. Trichobothrial pattern (fig. 1): M_3 in line with $M_{1, \text{ and } 5}$; $M_{2, \text{ and } 4}$ distal to this line; B_2 not in line with $B_{1, \text{ and } 3}$; $B_{3, 4, \text{ and } 5}$ form scalene triangle; M_1 in line with $D_{2, \text{ and } 4}$. *Patella* dorso-inner keel moderately developed and agranular. Ventro-inner keel weakly developed and bearing widely separated, inconspicuous, broad granules. Only traces of other keels. Dorsal surface sparsely granular with small granules. Inner surface densely covered with fine granules and a few, inconspicuous granules on dorso-proximad margin. Ventral surface shiny and agranular. Trichobothrial pattern (fig. 2): $P_{1, 2, \text{ and } 3}$ form scalene triangle; $P_{6, \text{ and } 10}$ cups touching line between $P_{2, \text{ and } 11}$; $P_{3, 8, \text{ and } 12}$ in line; $P_{4, 9, \text{ and } 13}$ almost in line; $P_{5, 7, \text{ and } 8}$ in line; $P_{6, 7, \text{ and } 8}$ and $P_{6, 7, \text{ and } 9}$ form scalene triangles; $P_{7, 8, \text{ and } 9}$ form isosceles triangle with $P_{7, \text{ and } 8}$ equal to $P_{7, \text{ and } 9}$; $V_{1, 2, \text{ and } 3}$ almost in line. *Femur* keels vestigial and agranular except ventro-inner keel which bears some inconspicuous granules. Inner surface with some large granules; other surfaces agranular.

Walking legs. Agranular and lightly hirsute. Tarsomere spine formula: $\frac{3}{4} \frac{3}{4}, \frac{5}{5} \frac{5}{5}, \frac{5}{5} \frac{5}{5}$.

OPISTHOSOMA: Mesosoma. All *tergites* smooth, shiny and agranular. Agranular vestiges of two pair of lateral keels on VII. Very sparsely hirsute. *Sternites* smooth, shiny and very sparsely hirsute. Only slight traces of lateral keels on sternite VII. *Genital operculum* anterior margin protruding more than opposite side; width 2.43 times length. *Pectines* with teeth 11/11; four small middle lamellae; small subtriangular fulcra; sparsely hirsute. Basal piece of pecten with posterior margin essentially straight but anterior margin has broad, median notch.

Metasoma. Segments I–IV very sparsely hirsute, V moderately so on ventral surface. Dorsal furrows poorly developed on segments I through IV; only trace on V. Dorsal keels poorly developed and agranular. Superior lateral keels vestigial and agranular. Median lateral keels lacking. Inferior median and lateral keels well developed but agranular on segment I; vestigial and agranular on segment II; lacking on segments III and IV and represented by one or two large granules on V. Crescentic area well marked but delimited anteriorly and laterally by widely and irregularly placed, mostly chisel-shaped, granules. Anterior crest of anal arch with about ten granules plus one or two denticulate granules on lateral termini. Posterior crest agranular. *Telson* moderately hirsute ventrally and laterally; clusters of 3-2-3 granules on ventral proximal margin. Subaculear tubercle distal edge forms about 80° angle with telson surface.

TYPE. *Holotype*, male, length 22.04 mm., AS no. 1861.1, taken 23 March 1953, by J. P. Figg-Hoblyn on Isla Espiritu Santo, Baja California del Sur, Mexico. Repository: California Academy of Sciences, Type no. 9561.



FIGURE 10. 1863.2 *Bioculus similis* Stahnke. ♂, holotype, dorsal aspect.

FIGURE 11. 1863.2 *Bioculus similis* Stahnke. ♂, holotype, ventral aspect.

Bioculus similis Stahnke, new species.

(Figures 10, 11.)

DIAGNOSIS. Holotype of *Didymocentrus caboensis* (female) from approximately same specific locality as that of this species (male). They differ as follows:

| <i>D. caboensis</i> | <i>B. similis</i> |
|---|-----------------------|
| 1. Three pair lateral eyes | Two pair |
| 2. Entirely with fuscous pattern | Entirely concolorous |
| 3. Pecten: 4 or 5 middle lamellae | Three middle lamellae |
| 4. Trichobothrial patterns: | |
| a) $D_{1,2,\text{and }3}$ and $P_{7,8,\text{and }9}$ form isosceles triangle | Form scalene triangle |
| b) $M_{1,3,\text{and }5}$, $E_{1,3,\text{and }4}$ and $V_{1,2,\text{and }3}$ in line | Not in line |
| 5. Ratio of carapace <i>length</i> to caudal segment <i>V length</i> = 1.19 | = 1.07 |
| 6. Carapacial taper determined by dividing <i>difference</i> between greatest posterior width and anterior width by carapace <i>length</i> = 0.53 | = 0.45 |
| 7. Ratio of sternum <i>length</i> to <i>width</i> at level of posterior margin of genital operculum = 1.11 | = 0.90 |
| 8. Ratio of pedipalp tarsus <i>length</i> to manus <i>width</i> = 1.25 | = 1.08 |
| 9. Ratio of third marginal lamella <i>length</i> to <i>length</i> of second marginal lamella = 1.73 | = 1.22 |

DESCRIPTION. Entire animal concolorous; dorsum, cauda and pedipalps light, leathery brown; legs, chelicera and ventor more yellowish; pedipalp chela somewhat reddish. Trunk dorsum essentially densely covered with very fine granules; cauda bearing some scattered granules. Pedipalp distinctly punctate; cauda very lightly so; other parts of body non-punctate.

PROSOMA: *Carapace*. Depth of anterior median notch (0.27 mm.) at level of approximately posterior one-third diameter of first pair of lateral eyes. Median ocular tubercle well developed, agranular with brown, variegated pattern with indistinct flanking longitudinal light areas. Entire carapace with indistinct, light brown, variegated pattern and with light band along anterior margin between lateral eyes. Surface shiny and densely covered with very fine granules laterally but mainly smooth medially and in region of moderately developed fron-

tal lobes. Sparsely hirsute. Median ocular furrows lacking. Anterior median, lateral ocular and central median furrows vestigial. Posterior median and posterior marginal furrows narrow and slit-like; latter indistinctly continuous with moderately developed posterior lateral furrows. Carapace length 1.05 times that of pedipalp tarsus. *Sternum*. Lateral sides subparallel. Small basal triangular pit with sides not vertical and broad apex which widens to form depressed, diamond-shaped flat area. Length 0.90 times width.

Pedipalps. *Tarsus* densely hirsute with slight trace of basal lobe. Distal fifth of inner surface bearing six large, lateral granules in clusters of 2, 1, 2, 1. *Tibia* fixed finger moderately to densely hirsute. Trichobothrial pattern (fig. 1): $D_{1,2,\text{and }3}$ form scalene triangle with $D_{1,\text{and }2}$ shortest side and $D_{2,\text{and }3}$ longest; $D_{4,5,\text{and }6}$ form isosceles triangle with $D_{4,\text{and }5}$ and $D_{4,\text{and }6}$ equal; D_4 distinctly distad to D_5 ; I_3 slightly proximal to line between $I_{2,\text{and }4}$. Manus interior distal one-third densely hirsute; exterior lightly so and bearing indistinct costate reticulum and relatively coarse punctations but few granules. Exterior marginal keel strongly developed, bearing coarse, confluent granules. Interior marginal keel bears very large, coarse granules on distal two-thirds. All other keels vestigial and not represented by fuscous stripes. Exterior surface reaches greatest convexity in regions of superior inner secondary, superior digital and superior exterior keels. Trichobothrial pattern (fig. 1): No group of three M trichobothria on line but distal margin of M_3 touches line between M_1 and M_4 ; $M_{2,3,\text{and }4}$ distinctly distad to line between $M_{1,\text{and }5}$; distal edge of B_2 touching line between $B_{1,\text{and }3}$; $B_{3,4,\text{and }5}$ form an obtuse isosceles triangle with $B_{3,\text{and }4}$ and $B_{4,\text{and }5}$ equal; large granule within triangle. $E_{3,\text{and }4}$ on same side of line between $E_{1,\text{and }5}$. *Patella* dorso-inner keel well developed but agranular. Dorso-exterior and ventro-exterior keels weakly developed and agranular. Ventro-inner keel moderately developed and bearing large, low broad granules. Dorsal surface with only small, scattered granules. Inner surface densely covered with very small granules and three or four large, tall granules on dorso-proximal margin. Exterior surface and ventral surfaces agranular. Trichobothrial pattern (fig. 2): $P_{1,2,\text{and }3}$ form isosceles triangle with $P_{1,\text{and }2}$ equal to $P_{1,\text{and }3}$; $P_{2,6,\text{and }11}$ in line but not P_{10} ; $P_{3,8,\text{and }12}$ and $P_{4,9,\text{and }13}$ in line; $P_{3,7,\text{and }13}$ and $P_{5,7,\text{and }8}$ not in line; $P_{6,7,\text{and }8}$ form isosceles triangle with $P_{6,\text{and }8}$ equal to $P_{8,\text{and }9}$; $P_{7,8,\text{and }9}$ and $P_{6,7,\text{and }9}$ form scalene triangles; $V_{1,2,\text{and }3}$ not in line. *Femur* dorso-inner keel weak but partially covered by moderately large, irregularly arranged granules. Dorso-exterior keel weakly developed and bearing large, confluent granules. Ventro-inner keel weakly developed but bearing scattered, large, broad truncate granules. Ventro-exterior keel vestigial and agranular. Dorsal surface sparsely granular. Inner surface densely covered with fine granules interspersed with large ones. Ventral surface moderately covered with fine to small granules. Exterior surface agranular.

Walking legs. Lightly hirsute. All legs shiny, agranular except for some moder-

ately large granules on inferior edge of femurs I to III. Tarsomere spine formula:

$$\begin{array}{cccccc} 3 & 3 & 4 & 4 & 5 & 5 \\ 3 & 3 & 4 & 4 & 5 & 5 \end{array}$$

OPISTHOSOMA: *Mesosoma*. *Tergites* densely covered with very fine granules and with only traces of keels. Lightly hirsute on lateral and posterior margins of tergites. *Sternites* lightly hirsute. VII bears traces of lateral keels. *Genital operculum* anterior margin protruding considerably more than opposite margin; width 1.69 times length. *Pectines* with teeth 10/11; three small middle lamellae; moderately hirsute; small to medium sized, subtriangular fulcra. Third marginal lamella length 1.22 times that of second. Basal piece of pecten with slightly convex posterior margin but anterior margin with broad, median notch.

Metasoma. Dorsal furrow moderately developed on I through IV but slightly so on V. Dorsal keels poorly developed, smooth and agranular on segment I and only slightly and inconspicuously granular on other segments. Superior lateral keels vestigial and agranular on all segments. Median lateral keels absent. Inferior lateral keels moderately well developed and agranular on I and II, with only slight, agranular traces on III, absent on IV and vestigial on V but bearing large, tall granules on distal portion. Inferior medians represented by large, confluent granules on I and II; slight vestiges on III; absent on IV and represented on V by row of about seven large, tall, widely spaced granules. Crescentic area well developed, about as long as broad but anterior margin outlined by an irregular row of large, tall granules with large, somewhat chisel-shaped granules laterally. Anterior crest of anal arch with about nine granules separated from lateral terminal granules. Latter granules continuous with those of crescentic area. Posterior crest agranular except for several, large cone-shaped granules on each lateral extremity. Caudal segments I through IV lightly hirsute; posterior two-thirds of ventral surface of V densely so. *Telson* ventral and lateral areas densely hirsute; clusters of 4, 5, 3 large granules near ventro-proximal margin. Subaculear tubercle distal edge forms a 90° angle with telson surface.

TYPE. *Holotype*, male, length 39.15 mm., AS no. 1863.2, taken 9 July 1938 by Ross and Michelbacher 10 miles southwest St. San Jose del Cabo, Baja California del Sur, Mexico. Repository: California Academy of Sciences, Type no. 9562.

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